

# MINING WORLD

**RESERVE'S** taconite team  
cuts costs and raises pellet output  
at Babbitt and Silver Bay ▶ 20

**ANACONDA'S** deep shaft  
program underway at Butte's Kelley  
and Steward mines ▶ 24

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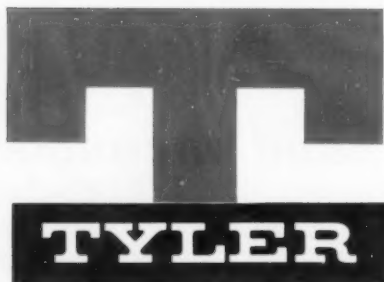
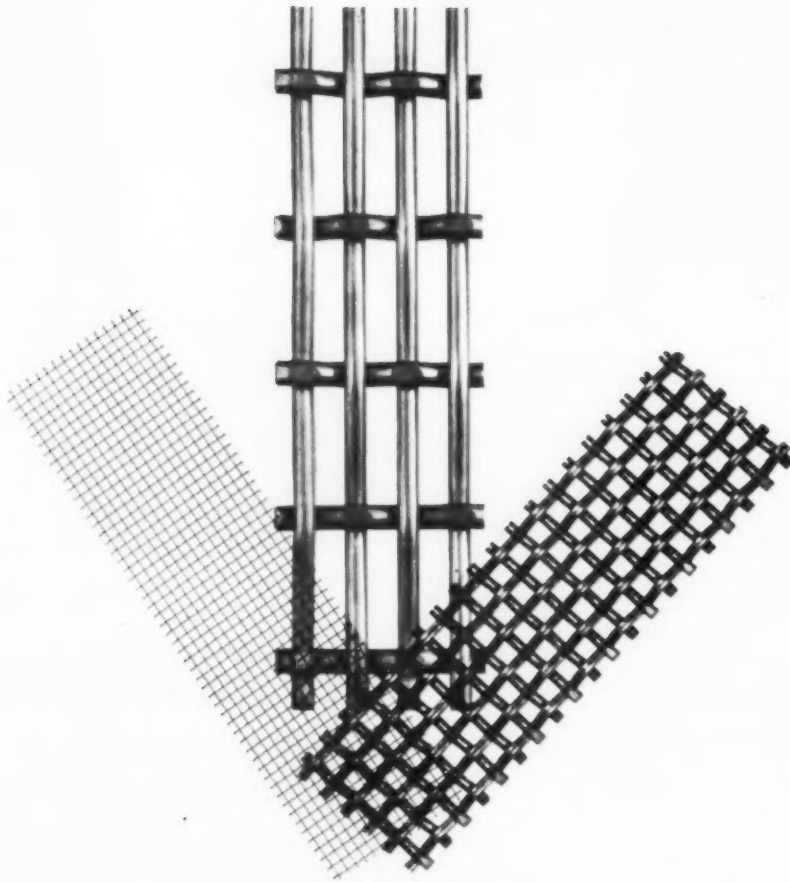
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# GRAB SAMPLES from the mail

## Congratulations on Studies

Dear Sir:

I take this opportunity of thanking you for regular copies of *WORLD MINING* which is both extremely helpful and interesting.

I wish to congratulate you particularly for the thorough studies which appear in many of your issues, like for instance the recent articles on Diamond Mining and Beneficiation, which give such an interesting overall view of our industry.

**R. J. Testut**  
Minerais & Métaux  
Paris, France

*The first diamond article appeared in October 1960 MINING WORLD, page 44. The second article in November, page 36, and the third and final article in this issue. Editor.*

## Negotiating—Not Sold

Dear Sir:

We, Alfred Deschenes, president, and Henriette Deschenes, vice president, of Crystal Creek Gypsum Company, Inc., would very much appreciate your printing a correction to the item listed under Wyoming of the column "What's Going On In Mining" in your December 1960 issue.

We, as directors of Crystal Creek Gypsum Company, Inc. did not agree to transfer the property to anyone, but we were negotiating for a sale at the time.

The property is for sale or lease at the present time.

**Alfred Deschenes**  
Crystal Creek Gypsum  
Company, Inc.  
Billings, Montana

## COMING CONVENTIONS

**February 22, 23, 24, and 25.** International Symposium on Mining Research, sponsored by the Missouri School of Mines and Metallurgy and the U. S. Bureau of Mines, Rolla, Missouri.

**February 26—March 2.** Annual convention of the AMERICAN INSTITUTE OF MINING, METALLURGICAL, AND PETROLEUM ENGINEERS, St. Louis, Missouri.

**March 30, 31, and April 1.** Fourth symposium on ROCK MECHANICS, Department of Mining, Pennsylvania State University, State College, Pennsylvania.

**April 4 to 7.** Course on COMPUTERS and COMPUTER APPLICATIONS in the MINERAL INDUSTRY, College of Mines, University of Arizona, Tucson, Arizona.

**April 7, 8, and 9.** Sixth annual MINING, MINERAL & PETROLEUM CONFERENCE sponsored by the Southwestern Alaskan Chapter AIME, Anchorage, Alaska.

FEBRUARY 1961

# MINING



# WORLD

... including the Export

Edition, WORLD MINING

VOL. 23, No. 2

February 1961

**Phelps Dodge** pays \$3,500,000 for 299 copper claims north of Safford, Arizona to become largest owner in this booming copper district. Deep drilling finds extensive mineralization 19

**Reserve's taconite team** has cut costs and raised tonnage and grade of pellets on Mesabi Range. Better blasting and better pelletizing have been keys to improved operations . . . 20

**Mining goes deeper** at Butte as Anaconda starts six point program to deepen Kelley No. 1 shaft to 4600 level and is sinking the Steward sub-shaft to the 5100 level . . . . . 24

**Caterpillar** bulldozer makes high waste dump maintenance easy at New Park Mining Company. Waste trains now dump into slot from permanent track and the Caterpillar pushes waste into canyon once a week . . . . . 26

**Hanna Nickel** mines Oregon laterite ore on top of mountain from open pit using careful grade control. Ore is transported to foot of mountain by aerial tram for smelting . . . . . 27

**How diamond recovery** has been increased in Africa by new methods and new equipment. This is the third and final chapter written especially for *MINING WORLD* to give full details on all phases of diamond mining and milling . . . . . 30

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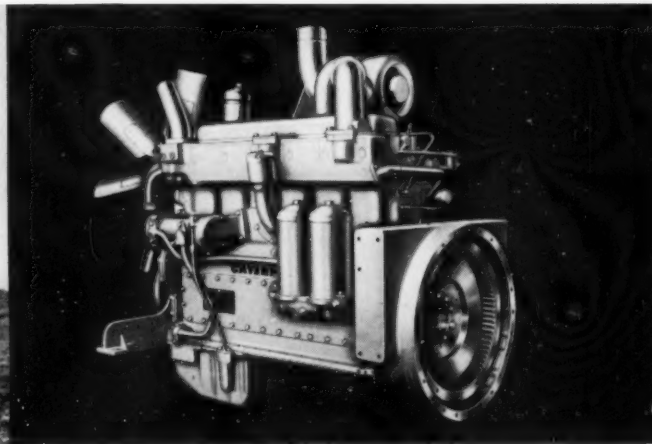
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Compact engine plus many other refinements assure top performance, easier servicing, long life



Important changes make up the new Series C No. 14 Motor Grader—big improvements throughout to give you better performance, long life and servicing ease:

**NEW COMPACT 150 HP ENGINE** The short, rigid block and stress-relieved crankshaft give greater strength and shock resistance. New cylinder head design resists distortion yet has superior cooling characteristics. Large water pump with cast-iron impeller, ceramic seal face, and carbon type seal combined with a 20 per cent increase in radiator capacity improves cooling, lengthens life.

**NEW STARTING ENGINE** All-weather starting with this new two-cylinder vertical gasoline engine is assured. Replacing the horizontal engine, this design features aluminum pistons and overhead valves for improved performance. Bore is 2.38", stroke is 2.38", and compression ratio is 8:1. Over-running clutch in starter pinion prevents damage to starter engine when diesel starts, a year-round starting plus.

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**MECHANICAL CONTROLS** —provide easy engagement. "Anti-creep" lock makes blade stay put under load.

**FULL VISIBILITY** —operator has unobstructed view of job even while seated.

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**THE NEW NO. 14C  
MOTOR GRADER —  
MADE FOR THE BIG JOBS**

# MINING WORLD

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## Bigger Type Speeds Reading

How many of you found that the January issue of MINING WORLD was easier to read? Good, that's what we wanted when we changed printers and had the chance to increase the size of type for the feature pages from 9 point type on a 10 point slug to 10 point type on a 10 point slug.

This means that there are the same number of lines of type per inch, but that the type size on each slug is bigger. You do the same thing in your open pit when you get a new and larger shovel which loads your trucks with fewer dippers. Thus you have the same load with fewer swings.

The Editors now have to convey the same meaning with fewer words on the printed page. Now with so much happening in the mining world, and with the readers demanding to know just about everything that happens, we were faced with the task of helping those who wanted reading comfort without subtracting any of the full details about that new mill.

Our solution has been greater selectivity to fit your interests, and compact writing. This means closer editing and better writing to make every word count.

Right along with the bigger type have been the recent changes sectionalizing or separating each article into logical components with appropriate head lines. Now the section on mining is readily apparent for the mining readers; milling practices are titled for the metallurgists; and ore occurrences for the geologists, as far as is practical.

Now you can select and read those sections of special interest so you get the concentrates without the gangue—and the editors work hard to get you to read the entire article so you can continue to be the best informed man on the job.

## Exploration Pays Off

Copper, iron, and uranium purchases make the industry's most important news in this issue of MINING WORLD. They are all multi-million dollar deals too.

Kerr McGee Oil Industries, Inc. bought out its minor partners in Kermac Nuclear Fuels Corporation's Ambrosia Lake, New Mexico operations. This was about a \$22,000,000 purchase by stock exchange.

Phelps Dodge Corporation paid some 50 small miners and claim owners about \$3,500,000 for 299 claims north of Safford, Arizona. This is PD's largest mining purchase in 30 years since it paid stock for Calumet and Arizona Mining Company's Ajo mine, the 85 mine, and mines and smelters at Bisbee.

United States Steel Corporation's Columbia-Geneva Division has paid between \$4,500,000 and \$5,000,000 for 16 patented and 46 unpatented iron ore claims in the Buena Vista district of Churchill County, Nevada. Sellers were Mineral Materials Company and American Exploration and Mining Company.

These sales are the successful culmination of more than 30 years of exploration in one instance and less than a year in another. They prove that there is big money for finding a large mineral deposit by a small miner or large company.

They are all out of the exploration stage. Good luck to you miners in finding more of them.



**Miner...or Miser?** You are looking at a man in the act of helping his employer save money. He is loading a hole with the new low-priced explosive, Du Pont HI-CAP.<sup>®</sup> This specialized explosive sacrifices nothing in quality or performance and gives you substantial economy except under the most severe conditions. Now available in four new small diameter grades for underground work, HI-CAP gives good fragmentation, good fumes. The denser grades also have fair to good water resistance.

This is just one more example of Du Pont's down-to-earth approach in providing you a complete line of explosives to solve every mining problem. Your Du Pont distributor or representative can arrange trials to show what HI-CAP can do for you. Du Pont, Explosives Department, Room 6440 Nemours Building, Wilmington 98, Delaware.

Grade	Stick Count*	Water Resistance
HI-CAP 1	120	Good
HI-CAP 2	135	Fair
HI-CAP 3	150	None
HI-CAP 4	165	None

\*1¼ x 8 cartridges per 50 lbs.



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# CAPITOL concentrates

GOVERNMENT ACTION AND REACTION AFFECTING MINING



## Senator Engle Introduces Gold Production Premium Bill . . .

California Senator Clair Engle's domestic gold mine subsidy bill has a flexible formula. In this case the amount of the subsidy would be set periodically by the Secretary of the Treasury, the goal being to stimulate sufficient domestic production to offset the gold drain.

The incentive payment would necessarily be different for different mines because one mine can get into production at \$45.00 whereas another

might take \$55.00. A ceiling would be put on the highest premium that could be paid under any circumstances. Senator Engle is reported to be drafting his bill so that the subsidy will continue until the Treasury balance re-attains the figure of \$20,000,000,000.

The Treasury's idea that we must never increase our gold stocks simply means that a diminishing gold supply

will face the additional burdens as the years go by of backing increasing amounts of currency necessary to finance commercial operations. Eventually we will have to increase the amount of gold on hand as reserve or abandon gold altogether because the supply on hand will be totally inadequate as backing for our currency and for the purpose of meeting demands in our gold from dollars held abroad.

## Silver Sales Will Continue For Benefit of Manufacturers . . .

The United States Treasury "believes it should continue to sell silver for industrial uses when requested," stated assistant secretary Laurence B. Robbins in a letter to Senator Dworshak of Idaho.

Previously, Senator Dworshak had suggested that the Treasury terminate its industrial sales to safeguard the nation's dwindling reserves of "free" or nonmonetized silver. He also had said that "higher prices for silver, especially when produced as a byproduct of lead, zinc, and copper, would greatly strengthen this industry and provide much needed em-

ployment for miners."

In his reply, Robbins said: "I cannot understand how this would strengthen the copper, lead, and zinc industry, inasmuch as the production of those metals at the present time appears to be sufficient to balance demand and any further production would have an unstabilizing effect on the price of the base metals. . . .

"A higher price for silver means that the consumers in the United States pay for the increase in a much larger proportion than is received by the producers of silver. Silver consumption in the United States has

been running at a rate of about 100,000,000 ounces per year, whereas silver production is at an annual rate of about 35,000,000 ounces. Inasmuch as consumption exceeds production by approximately 65,000,000 ounces, the consumers would pay to foreign producers 65 percent of the increased value of the silver. This would affect the balance of payments problem mentioned in your letter, inasmuch as the price for silver would increase the dollars that foreigners earn and such dollars do become potential claims against our gold supply."

## Lead-Zinc Subsidy Bill Is Reintroduced in Senate . . .

Senator Kerr with several other Senators has reintroduced the Edmondson small-mine lead-zinc subsidy bill as S. 115. Senator Bible of Nevada, the new chairman of the Senate Mining subcommittee, undoubtedly will call early hearings on the bill, as no doubt will Chairman

Aspinall of the House Interior Committee. While it is generally understood that President-elect Kennedy is committed to sign the bill, securing appropriations may be difficult.

The atmosphere in the 87th Congress seems somewhat more favor-

able to subsidy bills than in the past, but little change in the attitude of the House Appropriations Committee is reported. This brings up the question of what is the value in passing a subsidy bill and then not getting the money to finance the subsidy.

## Tariff and/or Quota Bills Expected on Lead-Zinc . . .

Both the Emergency Lead-Zinc Committee and the smelter group are expected to have tariff and/or quota bills introduced, the separate bills to

be tailored to suit the needs of each group. This is likely to create a somewhat difficult situation in the House

Ways and Means Committee. However, the recent drop in the prices of lead and zinc will put additional pressure behind the bills.

## Early Action on Wilderness Bill Is Expected in Senate . . .

Great pressure undoubtedly will develop to pass a so-called Wilderness bill during this session of Congress. The measure probably will be similar to the Murray bill of the closing days of the last Congress and

probably will penalize mining. It is understood that the bill will have active support from the new chairman of the Senate Interior and Insular Affairs Committee, Senator

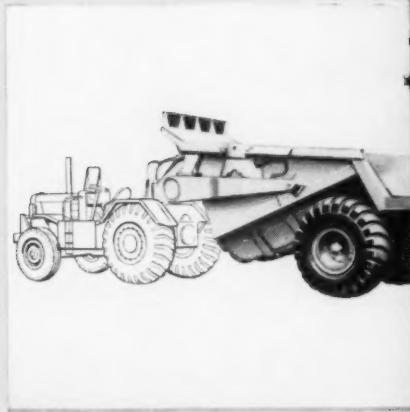
Anderson of New Mexico, and that very likely he will be the principal sponsor. If that is the case, it will mean fairly rapid action from that committee which will have jurisdiction over the bill.



**NEW 631** 420 HP (335 HP flywheel) . . . 31.2 MPH . . . 28 cu. yd. (21 cu. yd. struck).



**NEW 630** 420 HP (335 HP flywheel) . . . 41.5 MPH . . . 630A Tractor-Scraper . . . 28 cu. yd. (21 cu. yd. struck). 630-482C Tractor-Scraper . . . 35 cu. yd. (27 cu. yd. struck).



**NEW ATHEY ROCK WAGONS**  
38 ton PR630 and PR631 built by Athey Products Corporation.

## BIG! POWERFUL! NEW CAT 630 AND 631

**MATCH POWER TO JOB CONDITIONS—AUTOMATICALLY!**

*A new concept in power shift transmission coupled with a new 420 HP engine . . . plus other proven new developments . . . provides the last word in operating, service, maintenance ease and economy. The four-wheel 630 and two-wheel 631 join the widely accepted DW20, DW21 and 619 to give you an even broader choice of hauling units from Caterpillar.*

The new transmission and new engine on the 630 and 631 are designed and teamed to fit power to working conditions. This tailored power train, together with unit construction, greater scraper and wagon capacity, air-actuated cable control and new

tires, makes the 630 and 631 the ultimate in hauling equipment design! Some of the features are described here. For complete proof of performance, ask your Caterpillar Dealer!

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

# CATERPILLAR

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**ADVANCED AS TOMORROW  
—CERTAIN AS YESTERDAY**

### NEW 29.5 x 35 TIRES

This all-new tire size was originally developed for the 630 and 631, to provide the best combination of size, capacity and rideability at lowest cost per yard. These tires were proven by exhaustive laboratory and field tests.

### NEW SCRAPERS

Matching 28 cu. yd. heaped (21 cu. yd. struck) scrapers feature increased capacity, better loading. Sheave bearings now have 125-hour lubrication period. Other matching trailed units are also available.

### NEW CABLE CONTROL

Live power provides control whenever the engine is running. Air-actuated controls cut operator effort in half, yet retain "feel" of the control. New cable savers prevent breakage due to double-blocking.

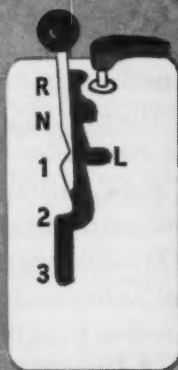
### IMPROVED STEERING

New two-jack steering makes the 631 easy to maneuver, yet retains "feel" of the road. Improved steering for the 630 absorbs shocks outside of the steering gear, provides easier handling in tight quarters.

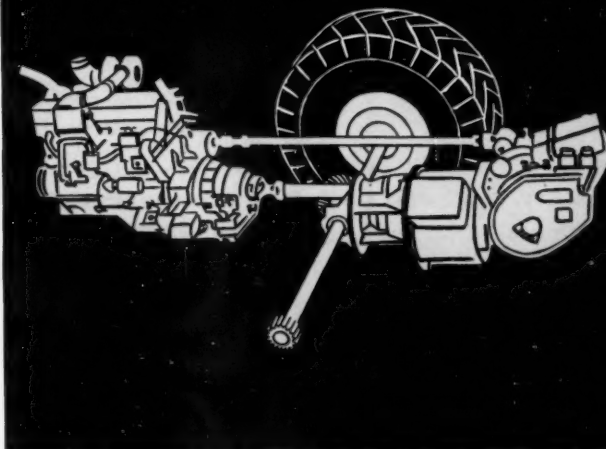




SHIFT INDICATOR



SPEED RANGE CONTROL



### 3 SHIFTS—9 SPEEDS

**POWER SHIFT TRANSMISSION.** This new concept in power shift transmission automatically adjusts the 630 and 631 to job conditions. Key to this system is the torque divider transmission mounted directly behind the engine, which combines planetary gears with a torque converter so as to provide power to the three-speed-range transmission in one of three ways: (a) torque divider drive (a combination of 75% direct, 25% torque converter); (b) direct drive; (c) overdrive. Result: nine different speed variations—but the operator need only concern himself with the three speed ranges and load range controlled by one lever. (A safety latch prevents accidental engagement.) The rest is completely automatic, governed by a mechanical-hydraulic system. Here's how it works:

Operator moves lever into *1*, first range, to start machine down haul road. The machine is now in torque divider drive for easy start and greatest rimpull. As speed increases, converter is no longer required, so the transmission shifts automatically to direct drive. When conditions permit, it automatically shifts to overdrive. As speed increases, the shift indicator dial shows operator when to shift to second speed range, *2*. Again the transmission automatically goes into torque divider drive. As before, when conditions permit, it automatically shifts to direct drive and then to overdrive. This same cycle can be repeated in third range.

### FULL UNIT CONSTRUCTION—EASIER SERVICING

#### TRANSMISSION UNITS

Range transmission is case mounted for accessibility, can be removed as a unit with cable control and differential carrier. Another timesaver: torque divider transmission is removable as a unit without disturbing the engine. Transmission control units are accessible without disturbing the transmission.

### NEW 420 HP ENGINE AND MATCHED POWER TRAIN

Downshifting is automatic, too. As transmission senses increasing power needs, it shifts down from overdrive to direct drive to torque divider drive. When conditions require it, the indicator tells the operator when to select the next lower speed range. Once back in the cut, operator shifts to load position, *L*. This locks the transmission in torque divider drive of the first speed range.

**ALL-NEW CAT ENGINE.** Designed specifically for the 630 and 631, this six-cylinder, 5.4" bore x 6.5" stroke D343 engine is turbocharged and aftercooled. It develops 420 HP maximum (335 HP at the flywheel).

Typical of the newness is head design. The engine is parallel ported with dual intake and exhaust valves for most efficient air system. Overhead camshafts eliminate rocker arms and push rods. New shelf head design results in fast coolant circulation for outstanding heat dissipation.

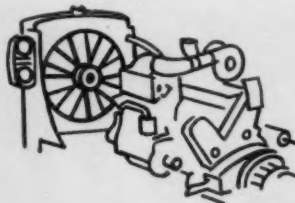
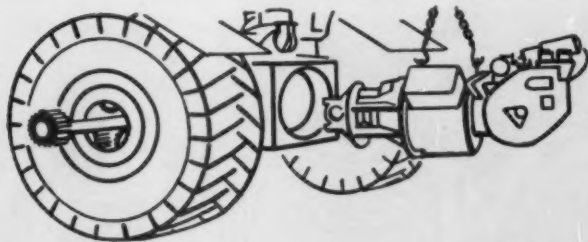
In addition to these and other new features, the engine offers . . . the economies of the proven Cat fuel system with precombustion chamber (burns No. 2 fuel oil—premium diesel fuel not required) . . . pressure ratio controlled turbocharger for optimum air flow throughout the engine operating range . . . aftercooler for greater air density for more complete combustion.

#### NEW RADIATOR-FAN UNIT

Fan is mounted on the radiator for more efficient cooling. Now radiator, side plates and fan can be removed as a unit for servicing—or to provide easy access to the front of the engine.

#### SERVICING TIMESAVERS

Dash swings away to expose entire left side of 631's engine. Crankcase guard pivots down for easy access to the bottom of the engine. For easy tire removal, rear fenders tip forward on the 630, and are easily removable on the 631.



**THIS IS MARION QUALITY.** Strange things can happen to steels in the  $-50^{\circ}$  temperatures encountered on the Iron Range. At such readings, ordinary steels can snap like brittle spaghetti. It's one of the big reasons why Marion uses high strength, high alloy steels at vital points throughout their intermediate size excavators. But, these new steels offer machine owners more than just excellent cold strength characteristics. For one thing, they're more resistant to fatigue and heavy shock loading. More important, their inherent strength permits lighter construction. That means your operator is lifting less dead weight... more payload. The man in the picture? Marion takes nothing for granted. He's performing one of dozens of quality check tests that every piece of steel undergoes, from the Marion laboratory to the final assembly station. The long way around? Perhaps. We're willing to let the profit figures for these Marions settle that one. Marion Power Shovel Company, Marion, Ohio. A Division of Universal Marion Corporation.



ASEA's new multi-rope friction mine hoists for installation in one of the largest mines take an unbalanced load of 55 tons at a speed of 2760 feet per minute—twice the load of any known hoist at this record speed.

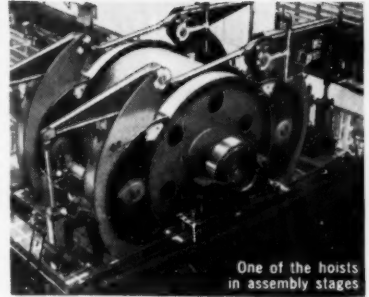
Here are two major advantages of these new mine hoists pioneered by ASEA for mine owners everywhere.

**1** MULTI-ROPE FRICTION DRIVE; this enables a moderate sized pulley (length, 7'2", diameter, 12'2") to take a very high unbalanced load with ease.

**2** FULLY AUTOMATIC OPERATION, which can save as much as \$30,000 a year per hoist at prevailing U.S. wage rates, assuming two-shift operation.

Make profitable use of ASEA design and engineering experience. Let ASEA save operating costs—in a big way just as it saves for 14 U.S. and Canadian mining companies. Write for literature to: ASEA ELECTRIC INC. 500 Fifth Avenue, New York 36, New York and 55 New Montgomery Street, San Francisco 5, California.

TECHNICAL DATA	
Hoisting . . . . . Double Skip	Hoisting speed . . . . . 2760 ft. per min.
Hoisting capacity . . . . . 1400 tons per hour	Number of ropes . . . . . 8
Net load . . . . . 55 tons	Rope Diameter . . . . . 1 3/4"
Skip weight . . . . . 44 tons	Diameter of Pulley . . . . . 12'2"
Depth of shaft . . . . . 3940 ft.	Length of Pulley . . . . . 7'2"
	Motor output . . . . . 12,000 h.p.



One of the hoists in assembly stages

**ASEA'S  
NEW MINE  
HOISTS  
BREAK WORLD'S  
LOAD RECORD**

Map labels include: Nyandoma, Kerchemya, Yelizarovo, Khanty Mansiysk, Tobolsk, Novaya Lyalya Tyumen, Sverdlovsk, Kurgan, Chelyabinsk, Kustanai, Kuvandyk, Orsk, Bulak, Ktyubinsk, Karag, Penza, Saratov, Engais, Liski, Kostroma, Semer, Cheboks, (Nizhni-Novgorod), Ufa, Chkalov, Orenburg, Magnitogorsk, Ufa, Chelyabinsk, Kurgan, Tobol, Ishim, Isil-Petrop, Atbasar, Karag.

**“My TD-24 almost equalled  
...*My faster TD-25's*”**



# size-bigger crawlers *deliver larger loads*"

—Charles W. McClinton, Oakman, Alabama

**"Actual on-the-job demonstration** proved my 4-year-old International TD-24's daily production approximately equalled size-larger competitive crawlers," reports Charles W. McClinton, for McClinton Coal Company, Oakman, Alabama.

"My TD-25's are faster all-around, and deliver larger loads than the '24. Planet Power-steering lets the operator cut big loads faster (than a clutch-steered, king-sized crawler)—and delivers the loads at a constant speed without loss of power on turns."

## **"Dead-track drag" eliminated**

Planet powered International TD-25's keep both tracks pulling full-time—to make full-load, full-power turns, or slam straight ahead with offset loads. And combined on-the-go, Hi-Lo power-shifting gives instant, up-or-down matching of power to condition.

You make full-load turns, and keep the blade loaded. You get constant-contact benching or highwalling, applying full power, getting full speed. "Dead-track drag" and "gear-shift lag" are eliminated.

*Exclusive Planet Power-steering makes the TD-25*

**Overburden 20 feet deep**, half earth, half rock, is being removed here to get at a 16-inch coal seam. This McClinton-owned TD-25 cuts down highwall, and removes berms. Operator simply shifts load-side track to high range, leaves other in low range to keep "25" on course without "bank-nosing."

*the industry's only power-shifted 8-speed gear-drive tractor or 4-speed torque converter tractor.*

**Power-shift and power-steer** the 230-hp TD-25 on tough overburden removal, benching, and highwalling. Prove what it means to your operating efficiency to match or outproduce size-bigger, clutch-steered crawlers. See your International Construction Equipment Distributor!



## **International<sup>®</sup> Construction Equipment**

International Harvester Co.,  
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A COMPLETE POWER PACKAGE

**Planet Power-steering** and on-the-go, Hi-Lo power-shifting teams with the 6-cylinder, 230-hp International DT-817 diesel—to pick up and "run" with loads like this, on the McClinton strip-mining operation. Dual valving makes this engine a "free breather," to give peak turbocharging efficiency.





**Proof from Jones & Laughlin!**

## Ni-Hard liners keep their contour after grinding better than 2 million tons of ore

**Here's photographic proof** from the Benson Mine, New York Ore Division of Jones & Laughlin Steel Corporation in upstate New York.

*Ni-Hard liners keep their contour — resist abrasion — provide a slow, uniform wear rate — are good to the last 1/4 inch.*

You could never tell by looking at them, but these Ni-Hard\* nickel-chromium-iron alloy shell liners have been grinding iron ore for more than 2 years. With better than 2 million tons of ore behind them, they've still got plenty of tonnage left in them!


Used in J&L's ball mills and rod mills — at the feed end as well as the discharge end — these Ni-Hard liners are delivering superior abrasion and wear resistance. They're saving many thousands of hours of downtime, many thousands of dollars in repair and replacement.

Try a set of Ni-Hard liners and see for yourself how the abrasion and wear resistance of Ni-Hard can increase your

tonnage, can lower *your* costs.

Our detailed 58-page booklet, "Engineering Properties and Applications of Ni-Hard" suggests many ways to put this versatile and long-lasting material to work profitably. Say the word and we'll be glad to send you a copy.

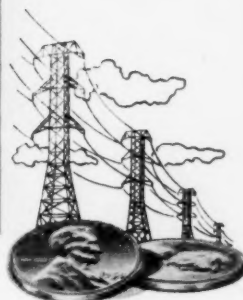
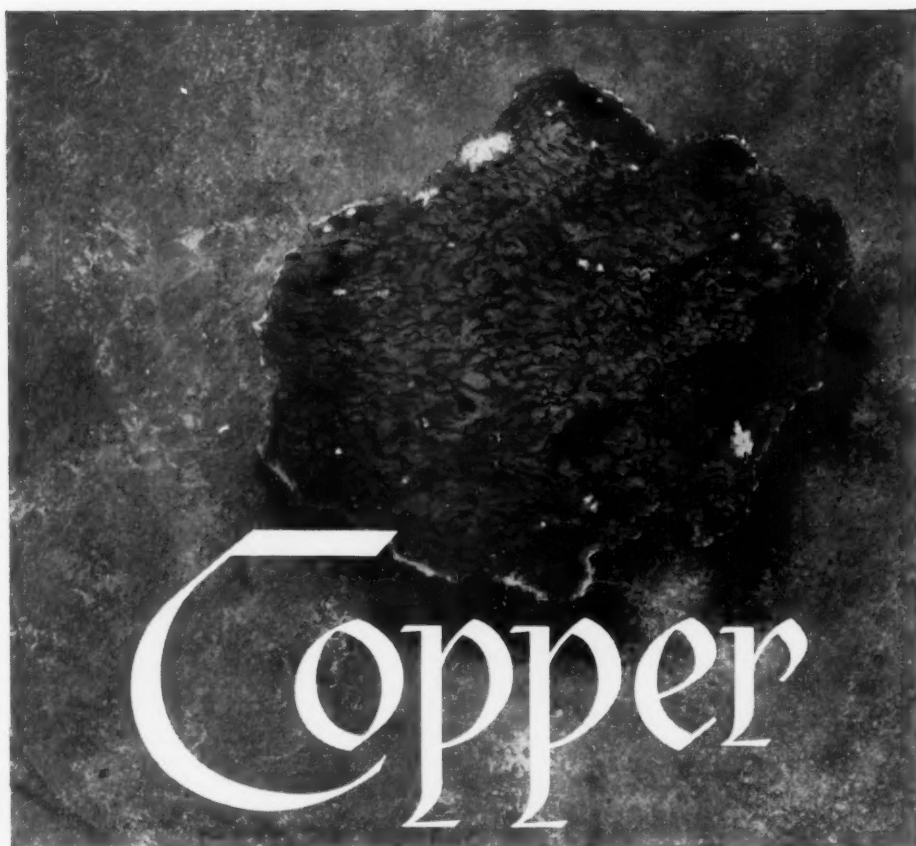
\*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.  
67 Wall Street  New York 5, N. Y.

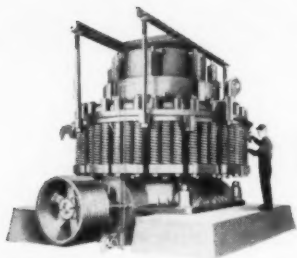
# NI-HARD®

NICKEL MAKES CASTINGS PERFORM BETTER LONGER





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**SYMONS® CONE CRUSHERS**  
 ... The machines that revolutionized  
 crushing practice ... are built in a  
 wide range of sizes, for capaci-  
 ties to over 900 tons per hour.  
 Write for descriptive literature.

The name *copper* is from the Greek *κυπρος*, Cyprus, one of the early sources of the metal. Copper has often been called "the common man's gold"—and has become a symbol of *money* due to its wide usage in the coins of many nations, as well as a symbol of *power*—since the greatest usage of copper has been as a conductor of electricity.

While native copper is the only metal found abundantly in nature, commercial production is supplied chiefly from various ores of copper, including chalcopyrite, chalcocite, cuprite and malachite.

Wherever these copper ores are processed—in Arizona, Chile, or the Belgian Congo—you'll find Symons Cone Crushers the leading choice among the world's prominent producers. For in copper ... *as in all of the important ore and mineral operations around the world* ... Symons Cone Crushers have consistently maintained their prominent position by efficiently processing large tonnages of finely crushed product at low cost.

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THE USEFULNESS OF A



6 or 8-yd. Lima Type 2400, shown stripping coal in Pennsylvania, also available with special 10-yd. coal loading dipper.

## Toughest mantle rock can't stop Limas

Limas are job-designed and built from the ground up for high output stripping and loading. They remove overburden fast and easy for high-speed loading of coal and ore. These are some of the reasons Lima's big, bold Type 2400 is a high-production mining favorite everywhere:

- **CRAWLERS** — Wide, long for extra stability; steered through air-controlled jaw clutches for easy handling
- **MAIN MACHINERY** positioned to hold counterswing to minimum, allow faster swing
- **DRUMS**—Extra wide, tandem mounted for more cable capacity, longer cable life
- **ANTIFRICTION ROLLER BEARINGS** reduce wear at all important bearing points
- **AIR-CONTROLLED CLUTCHES** are extra large; give instant response
- **TORQUE CONVERTER** reduces shock loading, prevents stalling . . . lengthens cable life, lowers maintenance
- **PRECISION AIR CONTROL** lets operator feel action without fatigue; means more output, greater efficiency

Judge the 2400 for yourself — ask your nearby Lima distributor for a free copy of the 32-page bulletin describing the 2400 in detail . . . or write to us here in Lima.

*There's a Lima type and size for every mining operation — shovels to 8 yd.; draglines variable; diesel or electric.*

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**CYANAMID**

# Reagent News

"ore-dressing ideas you can use"



## Synergism\* Down Under

### SODIUM AEROFLOAT® Promoter-Xanthate Combination Increases Copper Recovery at Lake George Mines, New South Wales

Realizing that better metallurgy could come only from more ingenious use of reagents, this well established property centered its laboratory and plant experimental work on new reagent combinations and thereby made very worthwhile gains in recovery.

Lake George Mines has for many years treated upwards of 500 tpd of intimately mixed sulphides in a 40% schistose gangue. Feed from several separate orebodies averages 5.5% Pb; 9.5% Zn; 0.6% Cu; 1.0 dwt Au/ton; 1.3 oz. Ag/ton and 15% Fe. Feed is ground to 77% minus 325 mesh to recover galena, sphalerite, chalcopyrite and iron pyrites in separate concentrates. Copper is floated ahead of lead using starvation quantities of reagent, depressing zinc with SO<sub>2</sub>.

SODIUM AEROFLOAT—sodium ethyl xanthate combination was used with good results until import restrictions necessitated replacement of SODIUM AEROFLOAT by xanthate alone from June 1958 to May 1959. Recovery and grade of copper concentrates fell off markedly during this time. Testing done during this period indicated that a combination of SODIUM AEROFLOAT and ethyl xanthate

would produce higher recovery than either reagent alone and the combined reagent schedule was adopted again in June 1959. Mill results for two twelve-month periods showed:

	June '58- May '59	June '59- May '60
	Xanthate only	SODIUM AEROFLOAT Plus Xanthate
Cu Conc. Grade	17.4%	19.2%
Cu Recovery	74.8%	77.2%

Copper is floated at pH 7 with cresylic acid as frother (0.06 lb./ton) and sulphur dioxide (equal to 1.25 lb. sulphur/ton) to depress zinc. When the promoter was sodium ethyl xanthate alone 0.15 lb. per ton was added. This has been changed to 0.08 lb. of xanthate per ton and 0.04 lb. of SODIUM AEROFLOAT per ton.

Cyanamid field engineers will be glad to work with you to evolve the reagent combination that will produce highest recovery at the lowest cost-plus-tails. Having a complete line of metallurgical reagents, Cyanamid offers unbiased counsel in their most effective use as well as prompt, unflinching delivery to every mining field.

\*Synergism—the cooperative action of two discrete agencies such that the total effect is greater than the sum of the two effects taken independently.

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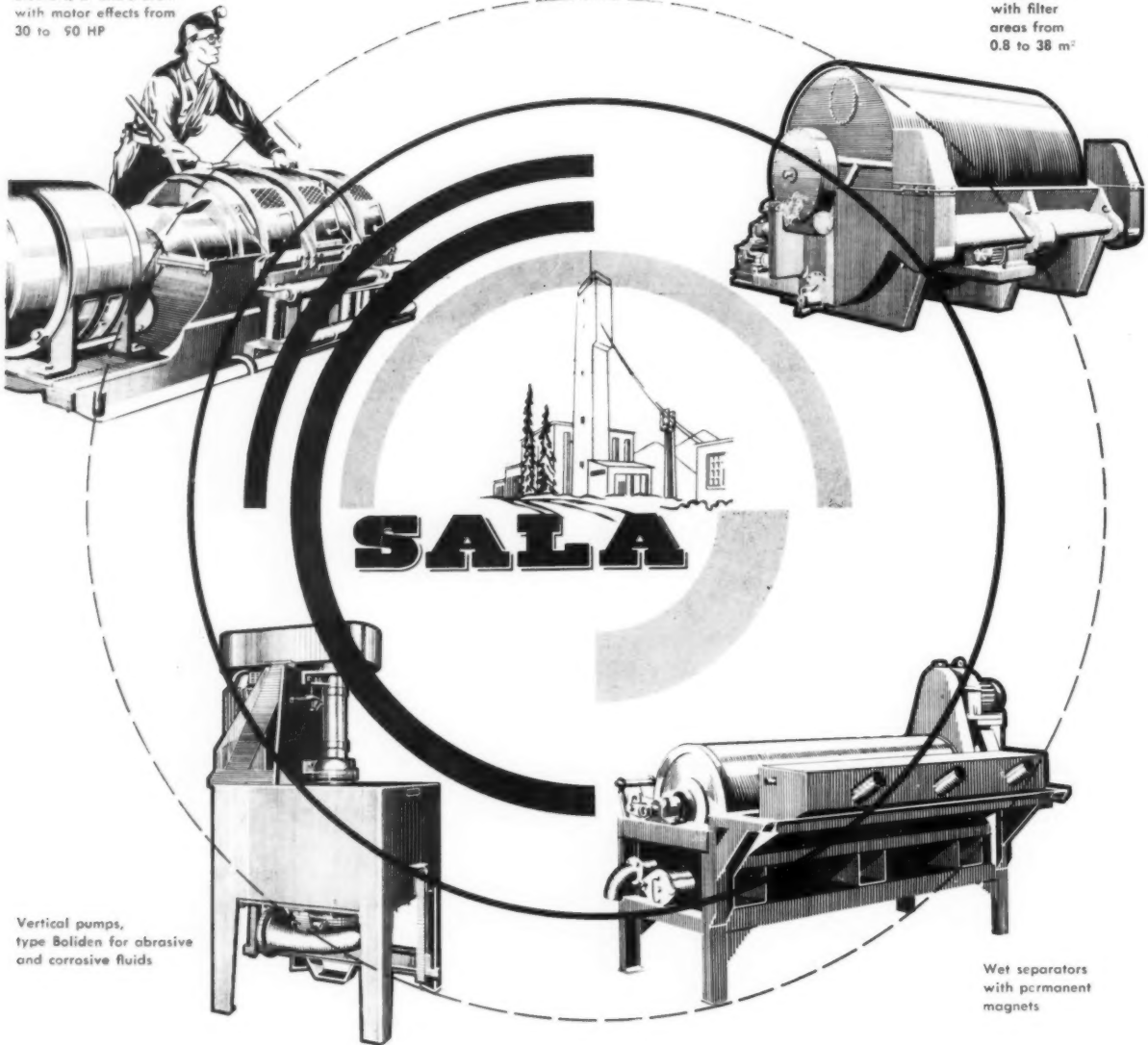
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Vertical pumps,  
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with permanent  
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Slushers, scraper buckets and sheave  
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ing transports of heavy materials

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pulpes and other abrasive materials

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## Phelps Dodge Pays \$3,500,000 For 299 Arizona Copper Claims

Location of Phelps Dodge Corporation's largest Arizona mine purchase in 30 years is shown on the adjoining place fix map. Claims and mining company holdings of more than 50 individuals were purchased by PD. Included in the sale were the Roper and Alta Vista mines. These had been located over 30 years ago and developed since that time by the Roper family of Safford. Other claim sellers include Ruskin Lines, Berg Betts, Joy Lambert, Roy Talley, Roberto Martinez, and Grant and Ray Godfrey.

The PD claims are close to the 120 which Kennecott Copper Corporation purchased for about \$4,000,000 in 1959 and which are now being developed by a new shaft.

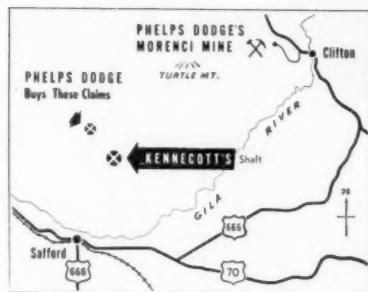
While no details of ore reserves have been released by PD, several industry observers believe that PD's deep drilling has proved "very substantial reserves of deeply-buried

low-grade ore which must be mined by underground methods."

Many Arizona miners also recalled that in 1931 PD secured control of Calumet and Arizona Mining Company through an exchange of stock to obtain the Ajo mine and reduction works, the smelter at Douglas, mines at Warren and Bisbee, and the 85 mine in New Mexico. They anticipate this new purchase will mean as much to the state as does the C&A acquisition.

It is known that PD drilled in search of a porphyry size ore body through 400 to 1,000 feet of post ore basalts, tuffs, late andesite, and agglomerates. Drilling targets were northeast (Morenci?) shear zones—quartz monzonite, granodiorite porphyry, and quartz diorite porphyry—plugs, stocks, and intrusions into quartz latite porphyry and andesite.

Kennecott is known to have a partially enriched zone of ore containing



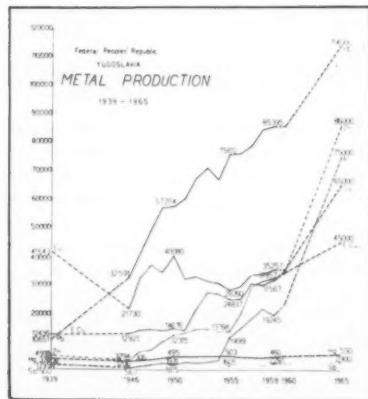
both sulphides and oxides. It is believed that PD's claims contain similar mineralization.

No PD plans have been announced to develop the claims and bring a mine into production. However, this would necessitate several of the steps outlined in the June 1959 issue of MINING WORLD as necessary for Kennecott to follow.

## Yugoslavia Has Ambitious Plans For Increased Metal Output

A major expansion of mining and metallurgy in Yugoslavia during the next five years will increase annual steel production to 2,100,000 tons, zinc to 90,000 tons, and lead to 120,000 tons. Output of copper, aluminum, antimony, mercury, and cadmium is also scheduled to rise sharply as the industry continues its rapid recovery from World War II setbacks.

The increase in steel output will be



implemented by a new mill at Skopje in Macedonia which will have a yearly capacity of 1,000,000 tons. Low grade ores will be treated in Krupp-Renn furnaces and smelted in Tysland-Hole furnaces.

A new lead-zinc mine at Sasa that starts production this year will have an output of 50,000 tons of concentrate when operating at full capacity. Other ore will come from Srebrenica in Bosnia where an old Roman mine has been revived.

Ten percent a year is the scheduled increase for the Mezica lead mines and smelters where a new low-level drainage tunnel will drain and develop lower levels at the mine during the next two years. At the Trepca mines lead smelters will be modernized, and factories for making finished lead products built. Expansion at the Celje zinc smelters, where output will rise to over 24,000 tons yearly, includes addition of Fluo-Solid roasters and a second sulphuric acid plant.

At the Sabac electrolytic zinc refinery zinc output is expected to reach 28,000 tons in the five-year

period. In addition, two new zinc smelters are proposed for construction, as well as more lead smelters.

The Majdanpek copper mine will increase daily output from 10,000 to 16,000 tons by 1965, while capacity of the new copper smelters at Bor is to be raised to 66,000 tons by that date.

Yugoslavia's plan to triple aluminum production calls for possible construction of a new alumina-aluminum plant besides doubling production at Kiricevo where the continuous Bayer-Pechiney alumina process is being adopted.

The rising rate of antimony production is expected to reach 3,000 tons by 1965, since the complex Sb-As ores can now be successfully treated. Mercury production should increase by about 70 tons a year in the next year or two. A new 250-ton-per-day Gordon Gould kiln is now being installed at the Idria mine.

Cadmium production is expected to reach 75 tons per year as a result of the expanded Sabac zinc-cadmium facility and output of other smelters that will be built.



**Robert J. Linney**  
President



**E. M. Furness**  
Assistant Executive Vice President

## How Reserve's Taconite Team

"Reserve Mining Company's accomplishments have been a team affair," says president Robert J. Linney as you talk to him in his Lake Superior front office overlooking the construction crews expanding the Silver Bay taconite processing plant.

Team accomplishments have been most impressive at this pioneering Minnesota taconite company. Shipment of 5,000,000 gross tons of pellets in 1960 from the mill with an originally designed capacity of 3,750,000 tons speaks for itself. Importantly too these pellets are higher

in iron and lower in silica than many metallurgists believed attainable when the plant started. From a blast furnace standpoint, which after all sets the marketability pattern, these pellets are much stronger than those originally produced, so breakage is almost nonexistent despite repeated handlings; the pellets are also more porous for fast furnace melting. In fact an Armco blast furnace rated at 1,500 tons per day of pig iron produced 2,700 to 2,800 daily tons using pellets.

These are some of the reasons that Reserve is now ex-



**PETER MITCHELL** mine, normally second largest ore producer in United States, is long wide flat still shallow open pit.



**SIDE DUMP TRUCKS** are used for long hauls so no time is lost in backing to crusher to dump 400 loads per day.

## Greatest improvement in mining has been better blasting with

At the Babbitt, Minnesota, mine, jet piercing footage per shift has been raised from 60 to 100, to 120, to 130, which means that only three of the company's seven piercers are scheduled for drilling. Hole size has not been changed, but the same volume of hole (average 9¼-inch diameter) is now drilled at faster speed. This takes more oxygen—12,000 versus 10,000 cubic feet—but means cheaper drilling. Better preparation

at the hole site speeds drilling, as great care is taken to scrape off all loose ore before the hole is collared in solid rock, so there are no delays drilling through the hard-to-pierce broken ore. Improved scheduling and at-the-hole drilling supplies—oxygen, water, and fuel oil—mean that the drills operate more hours per day, too.

Better blasting, better ore fragmentation have been among the most im-

portant developments in the entire Reserve operation. The combination of new blasting agents and more accurate hole spacing has resulted in muck piles which are 60 percent minus-3½-inches in size. Just 10 years ago, few dreamed that this was possible.

The powder factor today is 1.3 tons broken per 1.0 pound of powder. High by almost any other open pit standard, but low cost at Reserve be-



**E. C. Lampman**  
Manager Silver Bay Division



**Kenneth M. Haley**  
Assistant Manager Silver Bay Division



**Merlin G. Woodle**  
Manager Babbitt Division

## Cuts Costs and Raises Pellet Output

panding to an annual capacity of 9,000,000 gross tons of pellets in 1963.

For more of the team theme listen to Bob Linney as he says, "A classic example was our mechanical maintenance department's development of procedures for changing bowl and mantle liners in the fine crushing plant. They cut down time from six hours to 46 minutes per steel change." This description was published in the September 1958 issue of *MINING WORLD*.

From mine stripping to boat loading, Reserve's team

has learned to do a better job faster and cheaper. Here are some of the accomplishments:

They start right at mine planning, where assaying gives better grade control for higher mill recovery. Not surprising in view of the huge size is the fact that the ore body varies in iron content from horizon to horizon, and most importantly in ease of metallurgical recovery from ends to center. Therefore, they plan and mine the ore for blending so that the mill can treat for highest metallurgical recovery.



**ORE PRODUCTION TEAM:** Jet piercer, 6-yard electric shovel with 5-yard bucket, Diesel trucks, and cleanup Caterpillar.



**NEW GIANT OF THE MESABI** is this 90-ton trailer truck developed by Reserve with passenger car for size comparison.

## new blasting agents to achieve greater ore fragmentation

cause of better fragmentation. The new bulk explosives have made it possible, too, to increase hole spacing from 20 to 22 feet on 32- to 48-foot-high benches, which means lower piercing cost.

A wide variety of explosives and blasting agents have been and are being tested at Reserve, including ammonium nitrate with Diesel oil, TNT, EL 591, and others. Many of the holes are wet, which precludes

use of straight ammonium nitrate, but has the advantage of forming a blasting slurry. Practice is to obtain a high density load in the bottom of the hole (up to 72.5 pounds per foot). In some wet holes, air is introduced to agitate the slurry in the bottom to assure a high load factor. Double priming, one at the bottom and a second three feet from the top of the powder column, is standard practice. Primer is a type of dyna-

mite in 5½ by 30 inch cartridges with one XE 45 booster inserted in each cartridge; the Primacord loop is threaded through both the booster and primer. Regular blasts of 100 to 150 holes break about 300,000 tons of ore. Secondary blasting has been cut to less than one percent of total tonnage.

Better blasting means better muck piles for easier and faster shovel loading, with less wear on teeth and

buckets. Shovel factor is now 3,100 long tons per shift with 5-yard buckets on the 6-yard electric shovels. It is hoped to raise this to 4,200 with larger shovels and buckets; tests with 6- and 7-yard buckets are now under way:

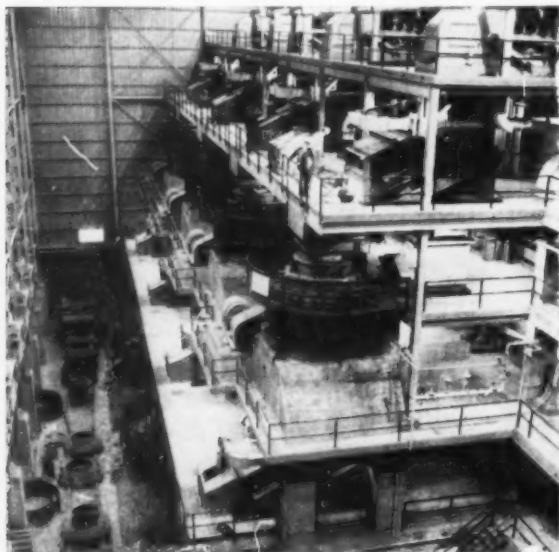
Engineering studies leading to bucket redesign (now a thick massive bucket is used), plus the better fragmentation, have raised bucket life from 400,000 to 900,000 tons. Similarly much study and research has been put into bucket tooth life, with the result that a new two-piece tooth with a 90 pound point has been de-

veloped which has raised life from 30,000 to 48,000 tons. Teeth are gauged each shift and worn ones are quickly replaced because of their importance in keeping shovel factor high.

Don't overlook how hard and heavy this taconite ore is. Brinell hardness of the taconite ore is 600 versus 430 on the bucket teeth, and it weighs 225 pounds per cubic foot in place. Every time the bucket is forced into the muck pile you get a machining action in which the taconite cuts the steel, in contrast to normal wear by abrasion at other pits.

Six shovels are used to load 54,000 tons of ore per day into 45-ton capacity (52 ton average load), side dump, semi trailer, 300 horsepower Diesel engine trucks. Record loading and crushing is 65,000 tons per day and 22,320 tons per shift. This means that over 400 trucks were loaded, hauled, dumped, and crushed.

In order to cut hauling costs as the pit lengthened for a maximum three mile haul to crusher, Reserve has designed and built a new 90-ton capacity trailer pulled by a tractor unit with two 235 horsepower Diesel engines. This is a semi-tandem unit



**TEAMWORK REALLY PAYS** at fine crusher where bowl and mantle change time has been cut from six hours to 46 min.

At the Silver Bay mill, 47 miles from the mine via company railroad, a lot of little improvements all add up to more efficient milling.

Grinding mills, both rod and ball, have all been lengthened by 2 feet—from 16 to 18 feet—by adding a section to the discharge end of each. The head is simply moved over two feet and the new section bolted in place. This has increased overall mill capacity by 8 percent, so that each of the 12 rod mills now grinds 164 tons of ore per hour. Rod size has been increased to 17.5 feet long by  $4\frac{1}{8}$  inches diameter.

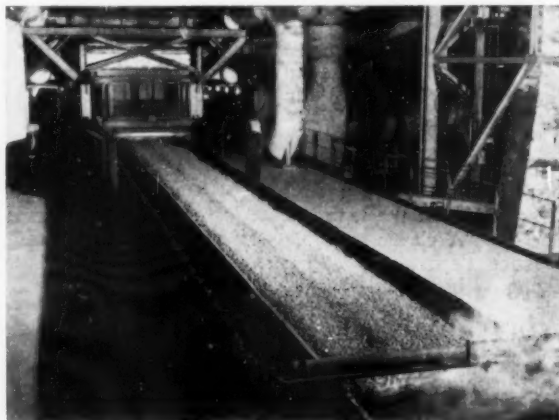
Grinding must be to 88 percent minus-325-mesh in the 24 ball mills for good pelletizing, and the silica content of the concentrate must be below 8.0 percent. Every four hours an analysis of ball mill overflow is made to check fineness of grind.

Magnetic cobbing efficiency has been greatly improved by the addition of a third drum, in series, to the

two-stage cobbbers originally used on the rod mill discharge. Now 35 percent of the original feed is discharged as tailing by these cobbbers. A repulping box is also used now between the first and second 36 by 48 inch magnetic drums.

The newest improvement in the mill flow sheet has been the replacement of the Hydroseparators by SiphonSizers, using the Hydroseparator tanks. This has resulted in a reduction in horsepower and an increase in concentrate grade. The silica content of the final concentrate has been cut by 0.02 to 0.03 percent, while the iron content of the SiphonSizer silica tailing has been cut to 2.0 percent or less. Formerly it was up to 8.0 percent, so that means an increase in iron recovery.

There have been more improvements in pelletizing and pellet firing than in any other metallurgical processes. This is logical in view of the fact that Reserve developed and op-



**PELLET FIRING** shown here, together with pelletizing, has shown greatest metallurgical improvement by Reserve Team.

## SiphonSizers reduce silica;

erated the first large scale plant in the world and that by evaluating operating results, ways and means can be found for improvements.

Better green pellets have been the key to improved firing. Each of the following contributes to better pellets: closer control of grinding to always maintain the 88 percent minus-325-mesh; perfect water content—just under 10 percent—in concentrate feed to drums; close control of the rotation speed of the balling drums with speed reset from gauges; reduction in vibration of drums by stiffening and bracing them longitudinally; balancing of drums so that they spin at a uniform rate; determination and maintenance of the best drum slope— $8^\circ$ ; and last but not least the small change in pellet size from  $3\frac{1}{8}$  to  $11\frac{1}{32}$  inch.

Bentonite consumption has been increased to 18 pounds per ton because of the increased fineness of grind. This is added to the concen-



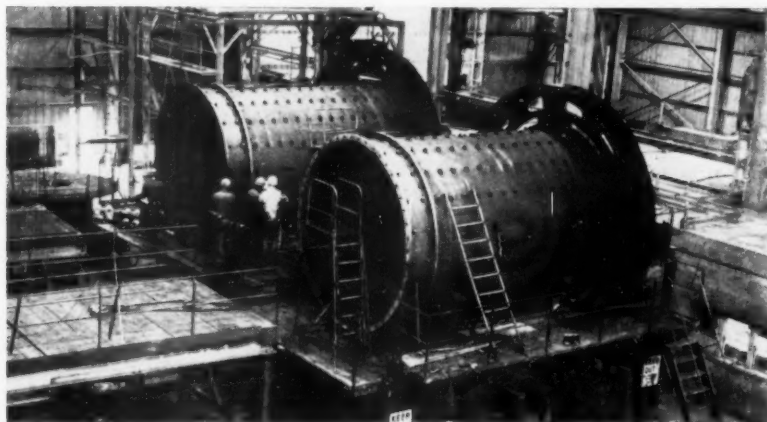
with 18 18 by 25 inch tires. The truck operates at speeds up to 30 miles per hour with a full load and has hauled as many as 22 loads per shift.

Tire cost is the highest individual item in mining. However, a small crushing plant has been built at the mine to crush low grade ore to minus-1/4-inch for use as road surfacing in the pit and for ballast on the new second railroad track from the mine to Silver Bay. This means that surfaced haul roads will be built and maintained at the mine right up to the shovel.

Crusher operation has been greatly improved by better blasting. Instead of the primary crusher, powder now breaks the ore; this has increased mantle life on the 60-inch primary gyratory from 800,000 tons to 1,800,000 tons. Concave life has been increased from 800,000 tons to 2,400,000. Comparable figures for the 30-inch secondaries are: from 300,000 to 400,000 tons on the mantles and from 250,000 tons to 300,000 on the concaves. However, this finer feed to primary crusher has placed the crushing circuit out of balance so that secondary costs have increased.

It is hoped that the new 90-ton truck will remedy this by quickly filling the primary crusher for choke feeding and making it do the work for which it was designed.

The mine engineering and industrial engineering staffs have played an important part in working with the mechanical department to make these equipment improvements possible. Time and work studies, on-the-job evaluation of new equipment, design of equipment, and better scheduling, are important functions of these departments.



**GRINDING MILLS** grow two feet longer by adding special end section to each of the ball and rod mills to increase length to 18 feet and capacity eight percent.

## improve green pellets for harder firing

trate ahead of the balling drums.

It is now apparent that bentonite is a key agent in pelletizing and firing, as it improves the rolling characteristic of the green ball in the drum. Originally it had been considered primarily as a binding agent and it still acts as such, but today its chief value is to prevent explosion and resultant disintegration of the green pellet upon rapid drying, which turns the 10 percent moisture into steam. The addition of the bentonite makes the pellet swell under heat so that it has the right looseness and porosity for fast steam escape. Without the bentonite the pellet would be too soft and would explode into pieces.

The pellets are screened as they roll from the balling drum, with undersize recirculating to feed; normally this is about a 100 percent recirculating load. The correctly sized pellets are then weighed magnetically as they pass to the coal reroll

drums. The weight of the pellets presets the coal conveyor speed. The weight scales on the coal conveyor in turn set the speed of the table feeder from the coal bin to hold the pounds of coal per foot of belt constant regardless of belt speed. The object is to accurately control the percent of carbon rolled onto the green pellet surface as it rolls through the coal coating drum. Now approximately seven pounds are rolled on per ton of finished pellets in contrast to an all-time high of 80 pounds.

The cut in coal consumption goes right back to better quality pellets—stronger and more uniform green pellets—which makes heat transfer in firing more efficient as air flow volume is increased to pick up more heat for transfer from firing to drying zones.

Drying without breaking is the key to furnacing of the coal-coated pellets. Thus the first seven wind boxes on the 168-foot-long by six-foot-wide

grate are updraft for drying to two percent moisture at 850 degrees F. using recycled heat. The next six boxes are covered by a refractory-lined oil-fired furnace divided into three temperature controlled zones. No. 1 is downdraft drying at 1,600° F. to completely eliminate moisture. The No. 2 zone, 12 feet long, is the pre-heat section, also down-draft and the temperature is kept at 2,350° F. The No. 3 ignition section is also down-draft at 2,400° to ignite the top two to three inches of pellets. The rest of the machine is down-draft to pull air down and through the bed for complete burning and pellet cooling. Control of the oil burner flame is important to minimize impingement on bed and blasting of pellets.

Actually the pellet burns and the iron is oxidized from  $Fe_3O_4$  to  $Fe_2O_3$ , generating 300,000 BTU's per ton. Concentrate grade is 65.5 percent iron to the balling drums. By the addition of oxygen, bentonite, and coal ash the grade of the fired pellet is cut to 63.5 percent; 61.5 as  $Fe_2O_3$  and 2.0 percent equivalent FeO.

The new No. 6 experimental machine has shown how to save an additional 100,000 BTU's per ton by lengthening 9 feet and updrafting the last 35 feet to capture extra heat for recirculating to the drying section.

Better pellets, more porous pellets, have improved firing and machine operation. Improved firing has meant that furnace feeder screens, finished pellet screens, grate bars, pallets, and pallet frames now have a longer life. Longer life of all parts means lower costs.

These are only the highlights of what the Reserve team has done. They have learned to do a better job on the job.

"They take the challenge and keep after it until satisfied it is the best that can be done any place," concludes Bob Linney as he picks up his hat and leaves the office for an in-the-mill appointment. END



RECENT AERIAL photograph of Butte Hill, the "richest hill on earth", shows the Berkeley pit (lower left), subsidence

from Kelley block caving operations (center left), and innumerable waste dumps from over 90 years of mining.

At Butte . . .

## Mining Goes Deeper With Anaconda

developing rich reserves at lower levels

### PROJECT HIGHLIGHTS

- Deepening and concreting Kelley No. 1 shaft to the 4600 level to establish a central hoisting shaft.

- Connecting the Kelley shaft to the Mountain Con, Steward, and Leonard mines with a series of haulageways.

- Construction of a hoist and generating room on the 3900 level of the Steward mine.

- Sinking of a Steward sub-shaft 1,262 feet to make the Steward the second deepest mine in Butte.

- Enlargement, concreting, and extension of the Tuolumne shaft, making it a central pumping shaft for all Butte mines.

- Construction of a new exhaust ventilation outlet through the Modoc shaft.

Once again Butte, Montana, is in the midst of a new mining development program. This one is designed to tap high grade copper reserves known to exist at deep levels, and increase the efficiency of the pumping and ventilation facilities of all the Butte mines. More than \$11,000,000 will be spent by The Anaconda Company in the next five years on several specific projects that

will eventually increase underground ore production by some 3500 tons per day. This is the largest development program undertaken by the company since the Greater Butte Project was initiated in 1947. Again, this action by The Anaconda Company emphasizes the fact that Butte Hill is indeed the "richest hill on earth."

The key to the new deep level development project is the large hoisting capacity of the Kelley No. 1 shaft, two compartments of which will serve for hoisting high grade ore to be mined from the Steward, Mountain Con, and Leonard mines. This added capacity for the five compartment Kelley will be in addition to the normal tonnage handled (12,000 tons per day) from block caving operations at higher levels.

The overall plan calls for the Kelley No. 1 shaft to be deepened 1,718 feet to the 4600 level. A haulageway will then be driven on the 3900 level 6,450 feet east to the Leonard mine which will be rehabilitated. An anticipated daily production of 1,750 tons of high grade ore from the Leonard will be trammed to the Kelley shaft and hoisted to the surface.



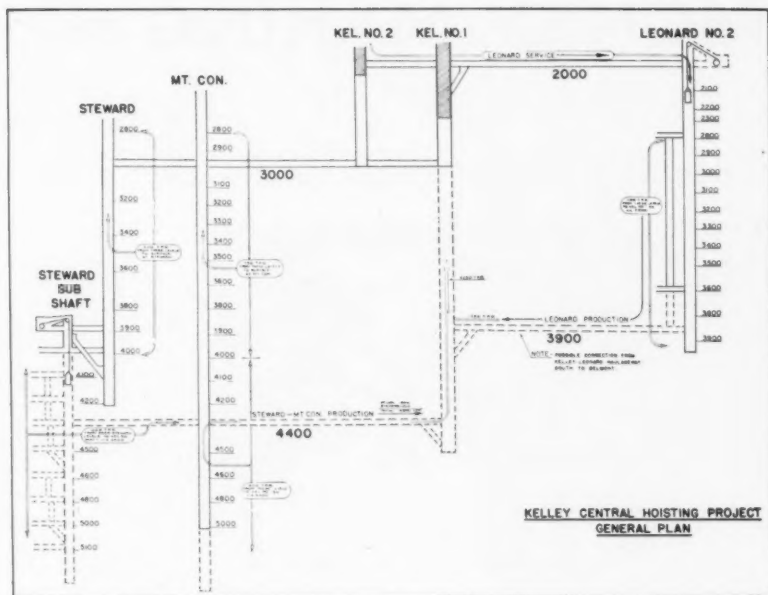
MODOC exhaust ventilation shaft rises above Berkeley pit waste dump.

A second haulageway will be driven on the 4400 level northwest to the Mountain Con mine, and a third haulageway west to the Steward mine also on the 4400 level. Both the Mountain Con and Steward mines will be deepened. Production of 1,500 tons per day from deep levels at the Mountain Con and 1,000 tons per day from deep levels at the Steward will also be hoisted to the surface via the Kelley shaft. Upper level production of 750 tons per day from the Mountain Con, and 500 tons per day from the Steward, will still be hoisted by their respective shafts as well as handling all service of men and supplies.

The Mountain Con shaft will be deepened to 5,350 feet making it the deepest mine in Butte. The present Steward shaft will not be deepened. However, a three compartment, concreted sub-shaft will be sunk 1,262 feet from the Steward 4000 level. This provides in effect an extension to the Steward shaft making it the second deepest one in Butte.

To provide hoisting facilities for the new Steward sub-shaft, a large concrete-lined engine room has been excavated on the 3900 level and a Vulcan-Denver hoist installed. This hoist is a 600 horsepower, double cylindrical, tandem model capable of handling a total unbalanced load of 28,500 pounds on either drum. Direct current will be provided by two 250 kilowatt motor generator sets installed beside the hoist.

Employing a 3800 drainage and a 3900 pumping level, the High Ore central pumping shaft has been successfully keeping Butte mines dry for many years. However, due to encroaching surface subsidence from block caving operations and the advance of the Berkeley Pit, the pumping facilities of the High Ore shaft will have to be replaced. Plans call for the rehabilitation of the old



**GENERAL PLAN** of Anaconda's underground development program shows the flow of 5,500 tons of copper ore per day from selective operations at deep levels.

Tuolumne shaft located 1,800 feet north of the High Ore. The Tuolumne will be deepened 970 feet to the 3900-foot horizon, and an 1,800-foot crosscut will be driven on the 3900 level to tie in to the existing drainage system.

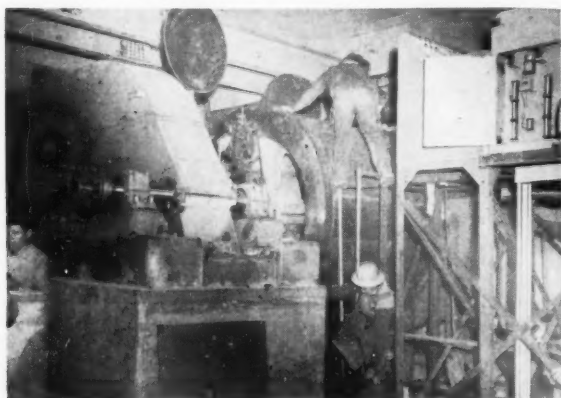
It is expected that the new large capacity pumping facilities in the Tuolumne will pump water 3,900 feet to the surface in just one lift. This will make the installation the deepest one-lift pumping operation in the world.

Since the Tuolumne is in an area used for dumping waste from the Berkeley pit, a 160-foot high concrete tower and collar has been constructed on top of the old shaft and surrounded by Berkeley fill.

An important part of the deep level development program is the

exhaust ventilation facility provided by the Modoc shaft. This 16-foot diameter concrete-lined shaft was sunk to 980 feet. From the bottom, two parallel horizontal 11- by 11-foot airways (crosscuts) have been driven 700 feet to another 16-foot diameter shaft which extends down another 480 feet. Since this is also in the Berkeley pit dump area, a concrete tower and collar similar to the Tuolumne will top the Modoc shaft. Work on this project was started in 1957 and is now practically completed.

Work on the other phases of this multi-million dollar program is now in progress. As they are completed they will contribute to the overall plan to extend the life of the Butte mines and produce greater tonnages of ore at lowest possible cost. **END**



**UNDERGROUND** hoisting installation to serve the Steward sub-shaft is on the 3900 level of the Steward mine.



**TUOLUMNE** shaft will be a central pumping station. Waste from the Berkeley pit will be dumped around concrete tower.

# MONEY MAKING methods

## Caterpillar Makes High Waste Dump Maintenance Easy



New Park Mining Company is using a Caterpillar D7 bulldozer to save manpower on its waste dump at Keetley, Utah. It formerly took two men to keep the waste track shifted and in line on the high dump. At times they couldn't keep the dump in shape to handle about 1,000 tons of waste per week.

Now, one hour a week with the bulldozer gives plenty of room to dump waste for a week. And this waste is dumped from a solid trestle with no shifting of track. The company uses the bulldozer for assessment work, building roads, plowing snow, etc. in addition to spreading waste.

The photograph taken from the end of the dump shows how the waste is pushed away from dump into canyon. The train of waste cars is pushed out on dump by Diesel locomotive and side dumped onto shelf or trench. The track is built on bents and cribbing to a height of 15 feet above shelf. As the dump is gradually lengthened, the track is extended by building another set of cribbing and filling it with waste.

The system works fine now, but it was slow getting started as it was necessary to go to the toe of the dump in the bottom of the canyon and anchor it in place with timber and steel rails so that the added weight on top of dump wouldn't slide the entire mass further into canyon. Once the toe was stabilized, the top bents and cribbing didn't move. The dozer has long since covered the bottom cribbing with waste but the track hasn't moved an inch. The dozer also compacts and stabilizes the dump as it pushes waste over the edge.

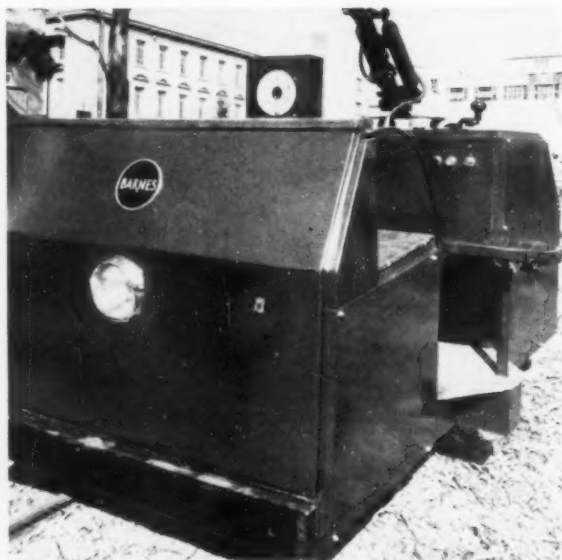
## Constant Torque at Any Speed with New A. C. Locomotive

A new type of underground electric haulage locomotive is now being tested in a South African gold mine. It uses a new, patented, variable-speed, alternating-current, electric motor for driving power. With this new motor drive, it is capable of infinite speed variation, from full speed ahead, smoothly through zero speed, to full speed astern, while maintaining a constant torque.

The locomotive was invented by G. W. Barnes of Barnes Engineering Co., Ltd., Johannesburg, and features one single handle for controlling all movements. It starts, runs, brakes itself, stops, reverses simply by moving the Variac slider. There are no switches, braking resistances, etc. on locomotive.

The machine generates a back emf and therefore has inherent regenerative braking. If the Variac slider is moved to a lower voltage, the motor brakes itself down to the appropriate lower speed, at the same time "pumping" current back to the supply.

The first 220-volt unit now undergoing a mine endurance test has a top speed of 4.0 miles per hour, a continuous drawbar pull of 540 pounds at all speeds, a starting tractive effort of 1,350 pounds maximum, and a braking force of 2,700 pounds maximum. There is no practical limit to the size of locomotive or power supply that can be built with this new motor.



PROTOTYPE MINE LOCOMOTIVE has been modified for use in mines. Handle, top right, controls all movements.



**OPEN PIT** mining atop Nickel Mountain in Douglas County, Oregon, has been underway since 1954. Each year over 1,000,000 tons of garnierite ore, averaging 1.5 percent Ni,

are sent to the smelter at the foot of the mountain by aerial tramway. This is the largest known reserve of nickel in the United States and was originally discovered in 1864.

## How Hanna Mines Lateritic Nickel Ore

**After 90 years, Oregon's Nickel Mountain has finally yielded its riches to make the Hanna Mining Company the world's fourth largest nickel producer**

by **John R. Bogert**  
Field Editor, *Mining World*

Douglas County, Oregon, has the unique distinction of having what is probably the largest known reserve of nickel in the United States. Deposits are located on top of 3,000-foot Nickel Mountain, and on adjacent slopes, four miles west of the town of Riddle. Although discovered in 1864, it took several wars and a growing domestic need for this strategic metal before The Hanna Mining Company took an interest in the area in 1948. Even then, extensive metallurgical testing was necessary before the French Uginé process was found adaptable to treat the low grade lat-

eritic ore (See *Mining World*, October 1960). Thus, it was 1954 before mining operations finally began. Today, Nickel Mountain is the only operating nickel mine in the United States, and during the past six years over 4,000,000 tons of ore, averaging 1.5 percent nickel, have been mined.

The Nickel Mountain deposit was discovered in 1864 by sheepherders who thought they had found copper. Early development work began in 1881 and continued until about 1900. During this time several shafts were sunk and exploration adits driven, with small shipments of ore being sent to smelters for experimental purposes. However, results were always discouraging. In 1893, The Interna-

tional Mining Company shipped considerable smelting equipment to Riddle, but it was never used. Minor chromite in the deposit attracted attention during 1914-1918, but no mining was done. In 1942 and 1943 the Freeport Sulphur Company carried out an extensive exploration program but with inconclusive results. Finally, the Hanna Mining Company leased the property in 1948.

In 1951 the results of the work done by Freeport Sulphur were turned over to Hanna, and a new program of geological work and metallurgical testing began. During 1951, 1952 and 1953, Hanna completed 35 churn drill holes, and bulldozed 20,000 feet of trenches. They



**SCREENING PLANT** has a wobbler feeder, jaw crusher, and a punched-plate screen. Conveyors send waste to reject pile (foreground) and ore to surge pile to right.

also sank three shafts to test drilling results and get bulk samples for their metallurgical tests. The results of this detailed work confirmed a sizable ore body averaging 1.5 percent nickel. Churn drilling has continued since 1953, and is still determining the lateral extent and depth limits of the ore body.

#### Nickel mineral is garnierite

The host rock of the nickel deposit is peridotite containing a large amount of olivine. The nickel mineralization in the ore body is garnierite, a complex magnesium silicate. It is derived from decomposition of the olivine during lateritic weathering. The deposit is considered to be of Tertiary age, and can be divided into three zones. The upper zone: a brick red soil layer from 0 to 10 feet thick that was formed under lateritic conditions. Nickel content for this zone averages less than one percent. The middle zone: characterized by a preponderance of silica in the form of limonite stained boxwork. Garnierite stains the boxwork giving it a light green color. The lower zone: characterized by garnierite veinlets filling fractures within the peridotite. This lower zone is transitional between the weathered material and the fresh peridotite. All three zones grade into one another and their depths are variable. Likewise, nickel values throughout the ore body are erratic, with rich garnierite concentrations grading down to barren peridotite within a few feet.

The ore body occurs in a trough on top of Nickel Mountain, and is approximately 3,000 feet wide by 6,000 feet long. It has an average

depth of 60 feet. The average grade is 1.5 percent nickel with small zones running as high as 8.0 percent.

#### Selective mining is necessary

Since nickel mineralization extends to the surface, the ore body is ideally suited to open cut mining methods. Accordingly, it has been developed by a series of 20-foot high benches having a minimum width of 50 feet. Haul roads at least 50 feet wide, with a maximum grade of 10 percent intersect the benches.

Mining is being done with three 54-B Bucyrus-Erie shovels equipped with 2½ cubic yard dippers. Every effort is made to maintain an aver-

age grade of 1.5 percent nickel in the ore. Since facilities for blending the ore are few, the demands of grade control determine mining procedure. Thus, shovels are located according to ore grade, and only two are normally operated in any eight hour shift. These shovels segregate the large waste boulders from the ore, and selectively load a pre-determined number of trucks from previously sampled faces. Daily ore tonnage mined and sent to the screening plant is purposely taken from different areas in the mine.

#### Blasting done with AM prills

No blasting is necessary in the fractured, highly weathered ore close to the surface. However, as mining progresses deeper the ore becomes harder, requiring considerable blasting. An Ingersoll-Rand "Down-the-Hole" unit drills 6½-inch diameter blast holes on 20-foot centers 25 feet deep. Blasting is done with ammonium nitrate prills mixed with Diesel oil, primed with nine-ounce pentalite boosters, and detonated by primacord with electric blasting caps.

Ore and waste are hauled from the mine to the nearby screening plant in six Oshkosh 30-ton dump trucks. These all-wheel drive trucks are equipped with 300 horsepower Cummins Diesel engines with Allison Torqmatic transmissions and retarders.

#### Screening plant rejects 15 percent

Ore from the mine is dumped by the trucks into a small surge pile in front of the screening plant. It is then pushed by a D-8 Caterpillar bulldozer into a small hopper and



**STRIPPING** is not necessary since nickel mineralization extends to surface. Soft lateritic ore is loaded by 2½ cubic yard shovels into 30-ton dump trucks.

thence onto a 54-inch National Iron wobbler feeder. This heavy-duty feeder consists of 12 rotating elliptical manganese bars spaced five inches apart. The crude ore under five inches in size passes between the bars, drops to a 42-inch pan feeder below, and is taken by a 30-inch conveyor belt to a 25,000 tons capacity ore surge pile. The oversize from the wobbler is fed to a 30- by 42-inch Universal jaw crusher set at six inches. Using a special diversion gate, the crusher discharge is directed to the ore belt or to a screen feeder belt, depending on ore grade and other factors.

The screen feeder belt discharges onto a 3- by 8-foot Simplicity punched-plate screen with three-inch openings. The minus-3-inch material is carried back to the ore belt. The plus-3-inch material is weighed and sampled on a 24-inch belt, and goes to a stacker and reject pile. Approximately 15 percent of the crude feed is rejected by the screening plant, and 90 percent of the crusher product is normally run over the Simplicity screen.

#### Aerial tram is 8,306 feet long

Crushed ore in the surge pile flows through a drawhole to a 48-inch pan feeder, and then onto a 30-inch conveyor belt in an underground concrete tunnel. It is weighed and sampled as it is carried to a 100-ton surge bin atop the loading terminal of the aerial tramway. At the surge bin a measured quantity of the ore is placed by an electrically controlled 42-inch pan feeder into an automatic tram car loader. This loader automatically fills the tram cars as they



**LOADING TERMINAL** for the aerial tramway contains a 100-ton surge bin. Ore from screening plant surge pile comes on conveyor belt out of concrete tunnel.

pass through the terminal.

A continuous aerial tramway, made by the Interstate Equipment Division of the Yara Engineering Corporation, carries the ore to the smelter stockpile at the foot of Nickel Mountain. This aerial tramway is 8,306 feet long, and drops approximately 2,000 feet in elevation between the mine and smelter. It is equipped with 63 ore cars of 56 cubic foot capacity carrying about 2½ tons of ore each. Contrary to most aerial tramways, these cars ride on two pairs of track ropes. The upper two-inch diameter ropes carry the loaded cars while the lower 1½-inch ropes carry the empties. The cars continu-

ally travel downhill upright and loaded, and return uphill inverted and empty. The system has a rated capacity of 250 tons per hour at a speed of 500 feet per minute. Two 300 horsepower induction generators control speed, and return about 500 horsepower to the line—about enough to provide for all mining operations.

Mining on Nickel Mountain goes on 5 days a week, and more than a million tons of ore a year are sent to the smelter in the foothills. The staff in charge of operations for Hanna is headed by Earl S. Mollard, general manager; and Edward (Jack) Maney, mine superintendent. **END**



**TRAM CAR** containing 2½ tons of nickel ore starts trip down 8,306 foot long aerial tramway which has a rated capacity of 250 tons an hour.



**AERIAL TRAMWAY** drops 2,000 feet in elevation between mine and smelter.

# How New Methods and New Equipment

In order to satisfy the tremendous increase since 1948 in world demand for both gem and industrial diamonds the African mining companies listed in table at top of opposite page have increased their scale of operations where possible and increased efficiency of recovery.

The competent engineering staffs of all companies have each made important contributions to the science of diamond recovery. Credit is due the companies that sponsored the Diamond Research Laboratory and to its excellent research staff for development of significant improvements in methods and equipment, particularly conditioning of wettable diamonds, the grease belt, the high tension separator and, it is expected, the optical separator, and basic research on heavy media separation.

At most of the mines new field or central concentrator plants and new recovery plants have been constructed within the past few years, several being completed in 1959. An appreciable decrease in unit cost of treatment has been realized, as well as an important improvement in security.

The engineering design work for the new plants was done by Selection Trust Limited for CAST and SLST, by Ateliers de Construction de la Basse-Somere for the new concentrator at Bakwanga, and by Fraser & Chalmers (S.A.) Limited of Johannesburg for the Williamson, Diamang MD-1, Kimberley Central, State Alluvial, and CDM.

At all diamond mines recovery processes are divided into two parts. A field or central concentrating plant using wet gravity methods combined with washing and screening to produce a concentrate that then is separated and reconcentrated by various methods in a maximum security recovery plant or 'picking station' until the percentage of

diamonds in the concentrate is high enough to permit hand picking. The final step of concentration in the recovery plant is always done by hand.

Alluvial material is given standard screening and concentration in diamond pans and jigs in a field washing and concentrating plant, of which there are about 120 operated by Diamang in Angola, Forminière at Tshikapa and Bakwanga, Congo Republic, by CAST in Ghana, SLST in Sierra Leone, and other smaller companies. The end product in locked cans is transported each day by truck to the central recovery plant. At CDM in South West Africa and Diamang's MD-1 operation the diamondiferous gravel is washed and screened at field plants and an intermediate size fraction is transported in rail cars or by truck to the central concentrator plant.

Kimberlite or alluvial ore at the De Beers mines in South Africa, at Williamson in Tanganyika, and Bakwanga, Congo Republic is first transported to a central concentrating plant from which the end product is transported by security enclosed belt conveyor (in boxes at Bakwanga) to the nearby recovery plant.

Though total production of diamonds during the decade ending in 1958 increased by about 180 percent, and the percentage of gems and industrials was fairly constant, the annual amount of sales as reported by the Central Selling Organization increased about 100 percent. Though these figures are not exactly comparable, they indicate that the unit price of diamonds has not followed the general increase in price during the period. Thus it is evident that the management and marketing policies, and the technology and practices of the industry are very sound.

## Heavy media replaces diamond pans and jigs for concentration

Starting in 1869, screening, washing, cradling, and hand sorting were used to separate and recover diamonds from South African kimberlite. The hand operated rotary washing pan, long called the "diamond pan," was developed in 1874.

The modern diamond pan is a flat bottomed steel pan 4 to 14 feet in diameter. It has an outside rim 8 to 15 inches in height, and an annular opening in the center about 0.3 times the outside diameter that is surrounded by a vertical rim several inches lower than the outside one, in which there is a depressed section forming the overflow weir at the upper end of the tailing launder or sluice. A vertical shaft through the center, driven from top or bottom, supports a spider having 4 to 10 arms, depending on diameter, on which vertical tines or rakes are mounted in a carefully arranged spiral pattern expanding outward in the direction of rotation. The triangular tines are set to clear the bottom by  $\frac{1}{4}$  to  $1\frac{1}{2}$  inches and the long face is positioned so that it will tend to plow the

solids in an outward direction. The head feed with water is introduced tangentially in the direction of rotation through a sluice or launder which terminates in a recess in the outside rim. In general the speed of rotation is adjusted to result in a rate of travel of the outside end of the arms of about 300 feet per minute.

During operation a complex condition of vortical and circulating flow is established within the pan, the surface slopes noticeably downward from the outside to the center and assumes a distinctive wave form. Particles of heavier specific gravity tend to settle and are gradually plowed to the outside where a concentrate fraction is drawn off intermittently through a small opening in the bottom outside corner of the pan. The diamond pan is used as a rougher concentrating device with the objective of efficiently recovering particles of heavier specific gravity rather than producing a high grade of concentrate.

The weathered kimberlite or yellow ground mined for many years by open pit method in South Africa con-

tained a high percentage of slime and fine particles which, in a diamond pan, formed a relatively thick pulp called puddle, so the operation was a form of semi-heavy media separation called puddle panning. The material also was very sticky and did not disintegrate easily in water so, to alleviate this condition, it was spread out on very large open fields known as Kimberley floors and stored in a continuously wetted condition for a period of up to two years to weather.

In all of the pipes in South Africa except the Premier, the hard unweathered kimberlite or blue ground now being mined also produces a high percentage of slime and fine particles and continues to disintegrate during washing and screening processes. As of 1959 puddle panning was used as a primary method of concentration only in the new central concentrator at Kimberley and at the Jagersfontein concentrator.

As harder material was encountered at depth, crushing by stages to  $\frac{3}{8}$ -inch was introduced as pretreatment for concentration. The diamonds



# Increase Diamond Recovery in Africa

Part III of III

World Diamond Production by Weight From Major Companies in 1959<sup>1</sup>

Producer	Location	Percent
<b>DeBeers Consolidated Mines, Limited</b>		
Wesselton, Bultfontein, Dutoitspan mines	Kimberly, C.P., South Africa	3.7
Surface plants (2)		
Jagersfontein mine		
Premier mine		
Kleinsee Alluvials		
Total		9.2
<b>State Alluvial Diggings</b>		
Alexander Bay, C.P.		0.6 <sup>2</sup>
Other properties in South Africa	Various	1.0 <sup>2</sup>
<b>Consolidated Diamond Mines of South West Africa, Limited</b>		
(Controlled by DeBeers)	Oranjemund, S.W.A.	3.6
<b>Société Minière du Becaka</b>		
Bakwanga, Kasai, Congo Republic		54.4
<b>Société Internationale Forestière et Minière du Congo (et al)</b>		
Tshikapa, Kasai, Congo Republic		2.5
<b>Companhia de Diamantes de Angola</b>		
Dundo, Lunda Dist., Angola		3.9
<b>Consolidated African Selection Trust Limited</b>		
Akim Concessions Limited	Atwalia, Ghana	11.6
African Diggings	Aliankama, "	
<b>Sierra Leone Selection Trust Limited</b>		
Yengema, Sierra Leone		2.5 <sup>2</sup>
African Diggings	" "	2.4 <sup>2</sup>
<b>Williamson Diamonds Limited</b>		
(50 percent owned by DeBeers)	Mwadui, Shinyanga Dist., Tanganyika	2.1
Various	French West Africa	1.1
Liberia, exports of stones not mined in the country		3.3
All other		1.8
Total (26,175,800 carats)		100.0

1. For accurate production figures see page 75, MINING WORLD Yearbook, April 25, 1960.  
2. Estimated.

by A. F. DAILY, consulting engineer, 488 Fairbanks Avenue, Oakland, California. He has been a consultant for various exploration and operating gold dredging companies in Alaska, Canada, New Zealand, Colombia, Brazil, and Honduras. He recently completed an extensive tour of the principal diamond mines in Africa, and directed the first technically engineered prospecting in Brazil for diamonds in a river valley gravel deposit.

Mr. Daily acknowledges and thanks Pato Consolidated Gold Dredging Limited for permission to publish this series of articles, the officials and management of the several mining companies, Anglo American Corporation, and the Diamond Research Laboratory for courteously providing information, and Mr. Antoine Moyer, Brussels, Belgium, author of the annual publication "The Diamond Industry" for permission to use statistics and information therefrom.

**PART I** in October 1960 issue outlined the companies and their holdings.

**PART II** in November 1960 issue gave full details of geology and mining methods.

## in most plants

break away or "pop-out" cleanly from the kimberlite and breakage is very rare indeed.

Following extensive research and experimental work a fine new central concentrator was completed in June 1958 at Kimberley where crushed ore from the Dutoitspan, Bultfontein and Wesselton mines is treated. The rated capacity is 960 short tons per hour. The minus-31.7-millimeter head feed is concentrated in 24-foot diameter primary pans, the minus-9.53-millimeter fraction of the reject is screened out, recrushed to minus-9.53 and returned to the primary pans. The minus-9.53 overflow is reconcentrated in 24-foot diameter secondary pans. The minus-3.33 fraction of secondary pan overflow is classified in hydrocyclones which produce an approximately minus-0.59-millimeter overflow tailing and an underflow which is reconcentrated in 3 14-foot and 12 8-foot diameter tertiary pans.

The concentrate from all pans advances to the central recovery plant where the plus-1.65-millimeter fraction is reconcentrated in one 7-foot



NEW CENTRAL CONCENTRATOR at Kimberley treats ore from three underground mines. Uses both pans and heavy media.

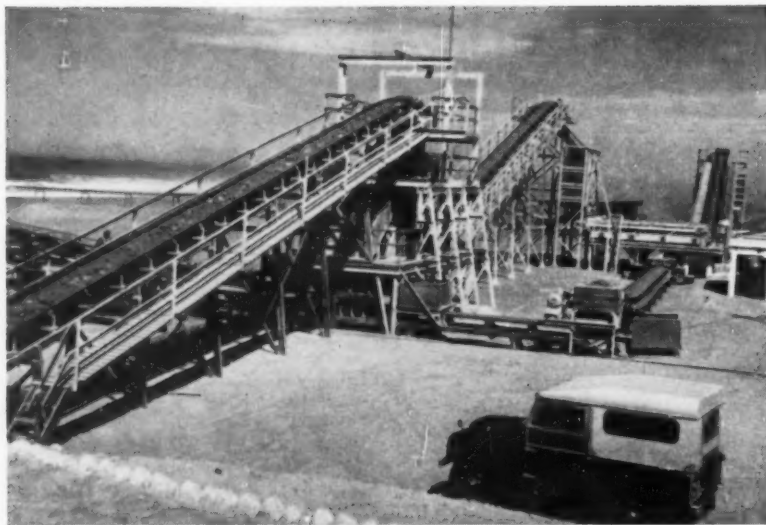
diameter heavy media cone. Auxiliary equipment includes an elaborate and modern system for maintaining the optimum composition and density of puddle (make-up density 1.25) in the primary and secondary pans and regulating rates of flow of feeds and pulps by remote control from a central recording and control room.

In about 1945 the engineers of Anglo American and DeBeers initiated a research program at Kimberley to ascertain if the relatively new process of heavy media separation using ferrosilicon and water in a cone could be applied for concentration of kimberlite. The results were very encouraging so a pilot plant with a 12-foot diameter cone, rated capacity 100

short tons per hour was installed in 1947 at the Premier mine, the only one of the South African properties where the ore was suitably amenable to this type of separation. This was the first significant advance in primary concentration methods for a period of about 60 years. The results were very satisfactory so a new heavy media concentrator plant having a rated capacity of 13,000 short tons per day was completed in 1950.

This was the first production application of heavy media in the diamond industry and in Africa, and at that time was the largest in the world.

Continued overleaf



FIELD WASHING PLANT for alluvial diamond bearing beach sands at Consolidated Diamond Mines, South West Africa. Tailing is conveyed to pile at right near sea.

The alluvial mines in Congo Republic and Angola early adopted South African pans and Harz jigs for concentration. As these mines are scattered and output is relatively small, present practice is to fit concentrator to mine size; 5 to 10 foot diameter pans with 4.0 to 13.7 cubic meters capacity per hour. For small mines and quick moves the concentrator plants are portable and are powered by wood-fired boilers, Diesels, or electricity from central stations.

The first unit in the standard plant consists of a revolving screen that rejects oversize at a selected particle size—25.4 millimeters at most of these

plants. The underflow as a dilute pulp advances to two diamond pans in series; overflow from the first is reconcentrated in the second, and the concentrate from both pans advances to a revolving sizing trommel which produces an undersize reject at a selected particle size, usually about 1.0 millimeter, and three or four intermediate size fractions which are separately concentrated in 2-cell Harz jigs.

The alluvial deposits in these districts generally contain a very low percentage of slime which would form puddle in a diamond pan. Therefore, the pan concentrating process is called 'clear-water' panning. The effi-

## Gravity separation achieve 500: 1 ratio

ciency of clear-water panning is significantly lower than that of puddle panning as practiced at Kimberley.

The Harz jigs used in the field washing and concentrating plants are of conventional design with two 40 by 80 centimeter to 50 by 80 centimeter cells in series, each combined with a plunger compartment. A number of different arrangements are used, e.g.; concentrate retained on the bed screen and removed by hand, or passing through the bed screen and continuously discharging into a security can; rounded and sized hematite or magnetite ragging, or no ragging. Following a great deal of study conducted over a long term of years, standards have been established for the various locations and deposits for bed screen openings, pulsation rate and stroke, bed arrangement, particle size range of ragging, depth of bed, etc. The optimum range of particle sizes of feed to each cell has been very carefully determined. The capacity ratings are in the range of 165 to 250 liters of solid particles per unit (2 cells in series) per hour.

The ratios of concentration that can be achieved by gravity methods depend on the percentage of satellites present in the head feed. The concentrate produced at field washing and concentrating plants of the type described above normally contains 20 to 40 per cent quartz, whereas that

## New central concentrators use heavy media because capacity,

The first two central concentrators outside South Africa were installed in 1951 and 1953 by CDM near Oranjemund, South West Africa. The first is a 12-foot cone for primary concentration; the second, a 5-foot cone, which reconcentrates the sink from the first.

The head feed is a minus-25.4 plus-1.91-millimeter size fraction of the gravel which was washed and screened in a field plant, then milled at the central concentrator to disintegrate conglomerate, eliminate sea shells, and partially clean the diamonds; total reduction about 20 per cent.

Because of a relatively high percentage of satellites in the head feed, consisting almost entirely of igneous

and metamorphic rocks, the total ratio of concentration in the two cones averages only about 50:1. The rated capacity of the concentrating plant is 120 metric tons per hour. A conglomerate fraction from some of the field plants is crushed and screened at the central concentrator.

In February 1953 a new central concentrator was completed at the Williamson mine in Tanganyika, equipped with two 12-foot diameter cones for concentration of the minus-32.5 plus-1.59-millimeter fraction of the crushed kimberlite head feed, and with Dutch State Mines type hydrocyclones using magnetite media for the minus-1.59 plus-0.99-millimeter fraction. The rated capacity is 400 short tons per hour and the average

ratio of concentration is 500:1.

In 1956 a new central concentrator was completed by Diamang near Luxilo, designated as the MD-1 operation, to concentrate the minus-25.4 plus-1.09-millimeter washed and screened fraction of gravel obtained from a group of three new mines. One 9-foot diameter cone was installed, with a rated capacity of 65 metric tons per hour and the average ratio of concentration is about 100:1.

In 1958 a new central concentrator was completed by State Alluvial Diggings at Alexander Bay, Namaqualand, South Africa, replacing a primary and secondary jig plant. The rated capacity is 140 short tons per hour and the minus-25.4 plus-1.65-millimeter fraction of the final head

## field washing plants of concentration

from heavy media separation contains practically none. The overall ratio of concentration at the Diamang and Tshikapa plants ranges from 300:1 to 500:1, and a higher proportion may be realized from either the diamond pans or the jigs, depending on the character and concentrating characteristics of the head feed and the operating procedures.

At Bakwanga there are eight field washing and concentrating plants of the type described above for treating alluvial material, and one special plant for treating weathered kimberlite. Here, as at Kimberley, much of the weathered kimberlite is very sticky and does not disintegrate easily. At the kimberlite field plant three size fractions are screened out, after one or two stages of pre-screening or concentration, and transported by belt conveyor to two large weathering piles where the rejects are stored in a wetted condition for a period of about two years. A portion of the head feed to the plant is reclaimed kimberlite from the weathering piles. The new central concentrator, which will be described later, is designed to eliminate the necessity and expense of storage for weathering and of retreatment.

At the CAST properties in Ghana the gravel in some of the deposits contains a high percentage, up to 32 per cent, of very sticky slime which



KIMBERLITE washing plant at Bakwanga, Congo Republic. The undisintegrated ore from plant washing is conveyed to piles at right for weathering before treatment.

forms 'clay-balls' when washed and screened. At five of the nine clear-water diamond pan and Harz jig field washing and concentrating plants the clay balls reporting in the reject oversize fraction (say plus-8-millimeter) are picked out by hand and transported to storage piles for weathering and subsequent reclamation. At two of the mines, where the problem is particularly troublesome, elaborate and carefully designed plants have been constructed to completely disintegrate the gravel and remove the slime ahead of the diamond pans. In one of these plants the principal units are large washmills in combination

with a Dorcco tilted dewatering cone and screens to remove oversize and undersize reject fractions, and the other is equipped with a large ball mill operated as an attrition mill at about 30 per cent of critical speed, using rocks as the grinding medium, and Handy cones. Because of the predominately small size of diamonds in these deposits the normal average size range of clear water pan feed is minus-8.0 plus-0.5-millimeters. The grade of concentrate produced is about 25 per cent diamonds and satellites, and the overall ratio of concentration may be as low as 25:1 in limited areas but averages about 300:1.

## efficiency, recovery, and concentration ratio are all high

feed is concentrated in a heavy media cone.

In 1959 the first sections were completed in a great new concentrator constructed at Bakwanga by Beceka at a cost of £3,000,000. The plant was designed to treat a mixture of alluvial gravel and weathered kimberlite and to gradually supersede most or all of the nine field washing and concentrating plants described above. In each of four parallel flow lines there are three large attrition (ball) mills intended to completely disintegrate the sticky kimberlite, using rocks from the gravel as a grinding medium. The washed, minus-25.4 plus-2.0-millimeter fraction advances to 12-foot diameter heavy media cones, estimated rating 60 metric tons

per hour each, and the washed minus-2.0 plus-1.0 fraction to Dutch State Mines type hydrocyclones using magnetite media. The expected ratio of concentration by heavy media separation is up to 500:1.

Thus the trend in primary concentrating practices is toward adoption, wherever practical, of heavy media separation, usually combined with hydrocyclone separation in magnetite medium for particles in the size range minus-2 plus-1.0-millimeters. The specific gravity of separation used in the central plants is 2.8 to 3.0 except in the second stage cone at CDM which is about 3.3. At all plants the sink product wash screens are protected with locked covers made of woven wire cloth or ex-

panded metal, and the concentrate discharges directly onto a security enclosed belt conveyor terminating in the nearby recovery plant building.

The principal advantages of the heavy media method of separation are: (1) high capacity per unit of plant area; (2) high tolerance at uniform efficiency for variations in rate of head feed; (3) maximum possible ratio of concentration in a single pass resulting in high grade of sink product; (4) high efficiency of recovery, 97 to plus-99-per cent; and (5) the very important feature of maximum security.

Turn page for more diamond recovery details ►

## Diamonds have exceptional affinity for grease so that a

In 1896 a DeBeers engineer discovered that if a wet diamondiferous concentrate from kimberlite is promptly dropped onto and washed over an inclined surface coated with amber petrolatum (vaseline) a high percentage of the diamonds and a low percentage of the satellites would adhere to the grease. A typical type of grease table that was developed consists of a series of four to eight trays, 8 to 15 inches long in the direction of flow, 36 inches wide, detachably mounted in step arrangement in a structural frame which is suspended from structural supports and is mechanically oscillated through a stroke of  $\frac{1}{4}$  to  $\frac{3}{4}$  inches at a rate of 170 to 220 revolutions per minute in a direction normal to the line of flow. The trays are set on an incline of 8 to 18° downward in the direction of flow, the larger the particle size the greater the angle. The head feed in a wet, drained condition is fed evenly onto the first tray, with a drop of about 4 inches, falls into a sheet of water, and flows down across the trays in cascade fashion. From time to time a thin layer of grease together with adhering dia-

monds and satellites is removed by hand with a scraper and a fresh coating of grease applied. The diamondiferous mixture is placed in a screen basket suspended in a small tank of very hot water to dissolve the grease, which is floated off into cool water where it congeals and is reclaimed for immediate reuse. The diamondiferous concentrate advances to other methods of concentration.

Various grades of grease have been developed by manufacturers for use on grease tables, principally for differences in the temperature of the water at the recovery plant. A softer or more "tacky" layer is applied on the surface on top of a stiffer undercoat applied directly to the roughened surface of the metal tray, the total thickness being about  $\frac{1}{8}$  inch. The surface coating is carefully compounded to standards established at each plant for specified temperature ranges.

Two improved step types of grease tables have been developed and are now being used in the recovery plants in South Africa. In the vibrating type a transverse motion is imparted with an electric vibrator, the trays are

larger and up to 48 inches in width and may be used on a flatter angle than those for the same particle sizes on the mechanically oscillated table.

In the Kimberley central concentrator the minus-31.7 plus-1.65-millimeter fraction of pan concentrate advances to heavy media separation in a 7-foot diameter cone where a 6:1 ratio of concentration occurs, the sink product is concentrated on grease tables at an average ratio of concentration probably in excess of 8000:1, and the final concentrate contains upwards of 20 percent diamonds. The minus-1.65 plus-0.59-millimeter fraction of pan concentrate is presented directly to grease tables where a ratio of concentration probably in excess of 20,000:1 occurs. At the Premier recovery plant the heavy media and jig concentrates advance directly to grease tables on which, because the diamonds have an exceptional affinity for grease, ratios of concentration up to at least 100,000:1 are realized.

Soon after commercial mining was begun in Congo Republic and Angola it was found that, to a greater or lesser degree, diamonds from the allu-

## Magnetic and high tension separation remove satellites while

During the early years of diamond mining in Africa the product resulting from concentration in cradles, diamond pans, and jigs was sorted and picked by hand. A large number of Europeans and Africans was required at the organized mines, the work was tedious, the results inefficient, and the security uncertain to poor. The first major advance in concentration methods was made in 1896 when the grease table was invented by Mr. F. Kirsten as a result of a research program undertaken by DeBeers. The next major advances resulted from a research program conducted by Mr. R. G. Weavind, Dr. A. A. Linari-Linholm, and staff in 1947 to 1950 in the Diamond Research Laboratory in Johannesburg, established by DeBeers and other diamond mining companies. The developments included the process of conditioning of certain diamonds to facilitate retention on a new type of device, the grease belt, and development of an electrostatic or high tension separator for reconcentration of certain diamondiferous concentrates. An optical detection and separating device for recovery of large diamonds has recently been developed by the laboratory and is being tested.

The flow sheets in all recovery plants are complex to very complex and provide for repeated retreatment of many reject fractions to effect a high percentage of recovery. The methods of concentration that may be employed efficiently depend on certain properties of the diamonds themselves and on the composition and properties of the constituents of the product of the concentrator. If quartz is present, it will report in certain fractions from which it must be separated; if some of the satellites are ferromagnetic, then electromagnetic separation may be used; if some will respond to high tension forces, then that method can be used, etc. Without exception each method and device is applicable to limited particle size ranges of concentrate and diamonds, and a great deal of study has been devoted to determination of the best size ranges at each property for its typical concentrator plant product.

The satellites occurring in some of the deposits contain ferromagnetic constituents which can, if necessary, be separated by magnetic methods.

At the Angola and Congo Republic properties the satellites contain a significant percentage of ferruginous

rocks and a lesser percentage of ilmenite so, fortunately, magnetic separation could be used as a secondary method of concentration. An early model of Krupp roll type dry magnetic separator installed in these recovery plants has been used up to date, and an Excelon multi-roll type dry separator is used in one plant.

The satellites in the Ghana Mines consist, in the finer particle sizes, of a high percentage of staurolite. Krupp dry roll type machines and a large Davis disc type dry separator are used as important secondary concentrating devices, and a small Davis machine in the final recovery room.

During the early years of operation at Tshikapa and in Angola it was found that, if the primary grease table reject was attrition milled, the diamonds would adhere much better to grease, and that a reduction of volume would also be realized. Use of the method was extended to the present practice of milling all except the largest size ranges of recovery plant reject fractions in closed circuit with small grease tables, to the extinction size selected for the plant, usually close to 1.0 millimeter. Ball mills up to 2.0 meters in diameter are used, some without liners and some

## grease table makes complete separation from satellites

vial deposits did not adhere well to grease, so other recovery methods were developed which will be described later. However, though the primary recovery on the step type oscillating grease tables might be as low as 70 percent, an important security advantage was realized. At Bakwanga it was found that crushing bort was even more difficult to recover on grease, which led to development of a transverse oscillating table consisting of a parallel group of channels, continuous in the direction of flow, which are coated with grease on the bottom and for about  $\frac{1}{8}$  inch on both sides. In this design diamonds that do not adhere to the bottom are thrown against the sides, resulting in an acceptable increase in percentage of primary recovery.

Soon after the research program was undertaken at the Diamond Research Laboratory in 1947 it was discovered that the surface of diamonds freshly released from unweathered kimberlite is non-wettable, or hydrophobic, which accounted for their excellent adherence to grease, whereas diamonds occurring in weathered

kimberlite and alluvial deposits have more or less of a coating of mineral salts which becomes wetted and insulates the diamond from contact with grease. The extreme case is the diamonds from the marine terrace deposits in South West Africa and Namaqualand, most of which are heavily coated. As a result of extended experiments it was discovered that, if a diamondiferous concentrate is conditioned for a short period in an aqueous solution of fish acid oil (basically oleic acid) and caustic soda, washed lightly on a vibrating screen, then promptly presented to grease, a high percentage of the diamonds would adhere and only a low percentage of the satellites and quartz.

However, it was also found that the rock dust present in concentrate, though in very small amount, became extremely hydrophobic and rapidly contaminated the surface of grease to such a degree that the diamonds would not adhere, so concentration of a conditioned feed on conventional grease tables was not practical. Further work resulted in development of the grease belt. The machine de-

veloped by the Diamond Research Laboratory consists of a 24-inch wide endless rubber belt, mounted on two pulleys about 12 inches in diameter and 7-foot centers, which is coated with grease on the outside surface and travels at 8 to 14 feet per minute. The entire assembly is mounted with the longitudinal axis level and the transverse axis inclined at an angle of 10 to 20 degrees, adjustable.

An electrically heated knife mounted slightly above center outside of the discharge end pulley continuously peels off a thin layer of grease together with imbedded diamonds and satellites (and quartz if present), which drops into a perforated bucket in a hot water bath. The grease surface is continuously restored from an applicator device mounted on top of the belt near the leading end. The combination of conditioning and grease belt, sometimes used with two belts in series, successfully solved the problem of efficient primary concentration of wettable diamonds and the method is being used by CDM, State Alluvial Mines, Williamson, and Diamond at its MD-1 recovery plant.

## jigs, attrition milling, and belt flotation recover diamonds

with Linatex liners, and with or without a small charge of balls. As mentioned above, the rate of rotation is about 30 percent of critical speed.

At the Diamang MD-1 plant the concentrator product is attrition milled ahead of conditioning and presentation to primary grease tables, and all rejects are milled to extinction size. At the Williamson plant an improved method of reduction called differential grinding is an important process in the recovery system. At CDM in South West Africa the head feed to the recovery plant is also differentially milled ahead of conditioning to partially clean the diamonds, but most of the satellites are so hard that little reduction occurs and milling to extinction is totally impractical.

In the recovery plants treating concentrate which contains an appreciable or high percentage of quartz, i.e., not a product of heavy media concentration (except at MD-1), the quartz reports in various reject fractions that are concentrated in Harz or Schiechel jigs to remove the excess. As some quartz, particularly angular shaped particles, tends to adhere to grease, removal before presentation to grease is desirable, but may not be practicable. Elimination of quartz is one of

the advantages of heavy media separation as practiced at most of the properties.

The Diamond Research Laboratory developed a very satisfactory type of high tension separator particularly suitable for certain diamondiferous concentrates.

In this method of separation a dry, granular head feed falls through a very high voltage discharging electrical field, in which electron flow and gaseous ionization take place, between a grounded spinning electrode and one or more positive electrodes. In this charged field some particles classed as non-conductors retain a surface charge and are or tend to be pinned to the grounded rotor; others, classed as conductors, do not retain a charge and are or tend to be lifted or thrown from the grounded rotor, thus effecting a separation into two fractions, or three if a middlings cut is taken. The principle of separation is the same as that of the well known Carpc high tension separator. Diamonds report as non-conductors (minor exceptions) and are pinned to the spinning rotor together with quartz and any non-conductor satellites that are present; ilmenite, ferruginous

rocks and others report as conductors; some mixtures do not separate cleanly and a middlings fraction is re-separated with difficulty.

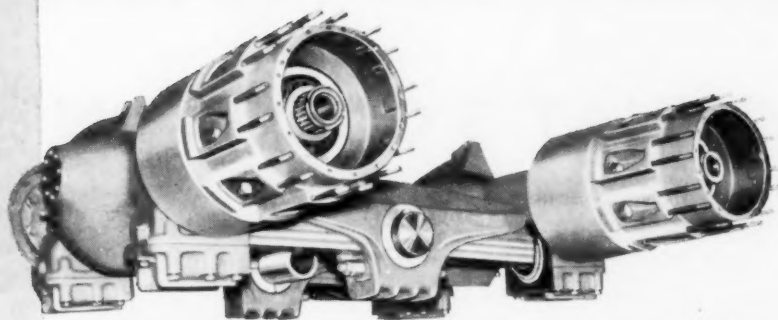
In the design developed at the Diamond Research Laboratory the grounded rotor is a polished steel tube about 5 inches in diameter with a variable speed drive for a range of about 60 to 150 revolutions per minute. The length of rotor ranges from 6 inches in a laboratory size model to 96 inches for the largest industrial model. The principal positive electrode consists of a bakelite tube about  $\frac{1}{2}$  inches in diameter, coated on the outside with a mixture of shellac and graphite, and filled with titanium dioxide powder, which is insulated from the frame and can be rotated by hand. This electrode is energized by a number of fine, curved copper wires extending from the positive conductor cable to the surface of the roll. A conventional, adjustable, taut-wire beam electrode is mounted above the tube, and a deflection intensifier electrode consisting of a bakelite or plastic bar with wire may be mounted in a higher position. The industrial models are vertically ar-

Continued on page 66



# **NEW...MACK 45-TONNER**

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# WHAT'S GOING ON in mining

## Kerr-McGee Acquires Full Ownership of Kermac Nuclear

Full ownership of Kermac Nuclear Fuels Corporation, operator of the nation's largest uranium mill, has been acquired by Kerr-McGee Oil Industries Inc. of Oklahoma City, which previously shared ownership with two other firms—Pacific Uranium Mines Company and Anderson Development Corporation. Full control came through an exchange of 878,000 shares of Kermac Nuclear common stock owned by the Anderson Development, for 200,000 shares of Kerr-McGee common, priced at about \$64.00 a share.

A few days earlier Kerr-McGee had acquired 20.81 percent of Kermac stock through its merger with Pacific Uranium Mines.

These acquisitions also boosted Kerr-McGee's ownership in the Ambrosia Lake Uranium Corporation to 75 percent. Pacific Uranium owned 25 percent of that concern, which has substantial uranium reserves near the Kermac mill, located 25 miles north of Grants, New Mexico. Anderson Development's 25 percent interest in that firm was acquired in the most recent deal, as was Anderson's 90 percent interest in dedicated properties in the Ambrosia Lake area of New Mexico and its total interest in mining properties in the Big Indian Wash district of Utah and the Shirley Basin area of Wyoming.

Both the Kermac mill and one operated by Kerr-McGee at Shiprock, New Mexico to extract  $U_3O_8$  and vanadium from uranium ore, use the solvent extraction process perfected by Kerr-McGee in its Golden, Colorado, research laboratory.

The Atomic Energy Commission has recently amended its uranium concentrate purchase contract with Kermac to provide for purchase of approximately 31,027,000 pounds of  $U_3O_8$  through December 1966 for \$237,000,000 at an average price of \$7.63 a pound. During fiscal 1961 Kermac officials expect that about 18 percent of all the uranium produced in the United States will be processed at their 3,300-ton-per-day mill, largest in the country.

## Firm Profitably Mines Steeply Dipping Potash Bed

A complete mine-to-market operation is being successfully carried on by the Montecatini Company in the Serradifalco area of Sicily. The mine is the S. Cataldo which supplies the fertilizer plants of Campofranco and Porto Empedocle.

The mineral deposit consists of various strata of potash in the form of kainite ( $KMgClSO_4 \cdot 3H_2O$ ), alternated with rock salt. It is estimated to contain reserves of some 10,000,000 tons.

The two main ore beds which are actually mined are very steeply dipping. The thinner of the two (about 2 meters thick) is mined by modified sub-level stoping; the thicker one (15 meters thick) is mined by room and pillar method. The levels are connected by a long cork-screw incline suitable for tire-mounted Joy equipment.

The ore is carried on conveyors from stopes to the crushing plant installed at

the bottom of the skip-equipped shaft. From the main shaft, 500 meters deep, about 300 tons per hour can be hoisted.

The ore is automatically transported to the processing plant where it is concentrated by flotation. Concentrate is then carried by an 18-kilometer-long aerial tram to the stockpile of the Campofranco plant. Annual capacity is 200,000 tons of potassium sulphate and other potash salts. Part of this potassium sulphate is taken to Porto Empedocle which annually produces 200,000 tons of complex fertilizers.

## US Steel Exports Manganese Mined by Brazilian Company

United States Steel Corporation has suspended operations at its manganese mines at Lafaiete, Minas Gerais, Brazil, since output from these deposits is now reserved to supply Brazil's rapidly expanding steel industry.

However, the United States firm is now exporting manganese ore from the mines of Sociedade Brasileira de Siderurgia S. A. (Chama Brothers) near Corumba, Mato Grosso, through contracts with the Brazilian company to purchase its ore and also supply technical assistance and equipment for its operations. United States Steel recently invested \$3,500,000 for the purchase of barges to transport the ore from Corumba to Rosario, Argentina.

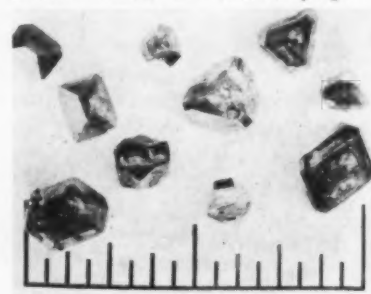
## U. S. Mineral Production For 1960 Nearly \$18,000,000,000

Mineral production in the United States during 1960 rose to a value of some \$17,800,000,000, second only to the record of \$18,100,000,000 set in 1957. It increased 4 percent over output in 1959, while metal production gained 28 percent over the preceding year.

Output of copper, iron, vanadium, and tungsten showed increases ranging from 40 to 60 percent, while lead, zinc, silver, manganese, the rare earths and thorium production declined. Uranium output value rose from \$141,000,000 to \$156,000,000 in 1960 and there were small increases for gold and platinum. Although primary aluminum production of 2,000,000 tons topped the previous record of 1959 by 50,000 tons, shipments did not keep up with output.

## General Electric Makes One-Carat Diamonds

Latest milestone in a research program



United States production of hand-sorted beryl containing about 11 percent beryllium oxide was approximately 210 short tons, while the consumption was 9,500 tons, almost all imported.

Metals for which a larger demand is expected from now until 1964, particularly for space travel experiments, are beryllium, molybdenum, tantalum, columbium, bismuth, tellurium, titanium, platinum, palladium and hafnium.

## Alcoa, Harvey Aluminum Continue Jamaica Projects

As an initial step in development of its bauxite properties near Jamaica's south coast, Alcoa Minerals of Jamaica, Inc., subsidiary of Aluminum Company of America, has awarded a dredging contract to Raymond International (Jamaica) Ltd. The work will be performed by Standard Dredging Corporation of New York under a sub-contract with the Jamaican firm.

According to Maurice Bennett, manager of Alcoa's Jamaican operations, the contract is for dredging and placement of fill to develop a port site at Rocky Point in Portland Bight. The project is to be completed by June 1, 1962, in preparation for development of facilities for mining and shipping bauxite by mid-1963.

The work at Rocky Point involves building a port and plant site to an elevation 11 feet above sea level, and constructing a three-mile causeway to the mainland which will support rail and road traffic. The total project is expected to use some 1,500,000 cubic yards of fill.

Another aluminum producer from the United States, The Harvey Aluminum Company, is establishing offices and a laboratory at Long Hill on the main Spanish Town-Guanaboa Vale Road. Harvey has been prospecting for bauxite in the St. John's-Red Hills area of St. Catherine about eight miles from Spanish Town. Building foundations have been laid for the pre-fabricated buildings which will be shipped to Jamaica. A drilling program continues in the area.

Harvey Aluminum is a subsidiary of Harvey Machine Company of Torrance, California, operator of an aluminum refinery at The Dalles, Oregon, which uses alumina imported from Japan. The concern is also prominent in aluminum fabricating.

to produce man-made diamonds is the success of General Electric Company (USA) in manufacturing these in the one-carat size range. Although dark in color and not yet of sufficient mechanical strength for industrial use, the new large diamonds are of great interest because of the uncertain supply from natural sources. First conversion of graphite into diamonds was in 1955, when General Electric produced some only thousandths of a carat in size. Since then it has increased control over size, quality, and shape to produce diamonds that are equal to natural diamonds for many industrial uses. Diameter of diamond at lower left in picture is 0.635 centimeter.



## Arizona

### Short Course on Computers Set for Tucson, April 4-7

What computers mean to the mineral industry will be discussed April 4 through 7 at Tucson, Arizona, when a short course on this subject is sponsored by the Department of Mining and Metallurgical Engineering, College of Mines, University of Arizona, in cooperation with the Numerical Analysis Laboratory, College of Engineering of the University.

The four-day course on "Computers and Computer Applications in the Mineral Industry" will have morning, afternoon, and evening sessions, except on the last day (Friday) when the meeting concludes in the afternoon. Cost of the course is \$100, and those interested in attending may write to Dr. James D. Forrester, Dean, College of Mines, University of Arizona, for further information.

The program will include the following papers of particular interest, all presented by University personnel: Use of Computers in Equipment Analysis, E. R. Drevdahl; Application of Computers to Open Pit Ore Reserve Estimation, R. F. Hewlett; Application of Computers to Underground Ore Reserve Estimation, Dr. W. C. Lacy; Application of Computers to Metallurgy, R. Schenk and E. Kehr; Use of Computers in Determining Pit Limits and Expansions, T. E. Caldwell; Use of Computers in Exploration Projects, Dr. W. C. Lacy; Production Scheduling and Linear Programming, R. F. Hewlett, and Computer Pitfalls, Dr. H. Tucker.

### Hunting Geophysical Adds To Arizona Land Under Survey

The Papago Indian Tribal Council has approved, by resolution, a mineral exploration contract with Hunting Geophysical Services, Inc. The proposed contract is being reviewed by the Indian Bureau and the United States Geological Survey for final action.

Under terms of the contract, Hunting will pay the Papago tribe a lump-sum of \$20,000, whether or not any minerals are ever mined. In return, Hunting will have the exclusive right to explore the entire reservation except for areas covered by prior applications. At the end of the first year, Hunting is to release to the tribe one-half of the acreage; and at the end of 18 months, another one-quarter. The remaining quarter can be held for a three-year period, at which time it must be returned to tribal jurisdiction or retained in whole or in part under standard mineral leases.

Hunting Geophysical Services, Inc., is the New York, New York, prospecting company which obtained an exclusive surveying permit last year for the San Carlos Apache Indian tribe. In that instance, however, no lump-sum was paid for the privilege of making the survey. The permit was transferred later to the San Carlos Exploration Company of St. Paul, Minnesota.

Kenneth N. Garard, mining engineer of Scottsdale, Arizona, represented the Papago Tribal Council at negotiations with Hunting.

Mine owners as well as citizens of Santa Cruz County, Arizona, are joining to fight the Southern Pacific Company's request to abandon its Patagonia branch railroad from the main line at Fairbanks. This is the only railroad which serves the mining districts and transports all concentrate from American Smelting and Refining Company's Trench-Flux unit to smelters as well as carloads of high grade ore. Robert Lenon, mining engineer, Box 525, Patagonia, is calling attention to this abandonment so as to give mining companies the opportunity for formal protests. He will be glad to supply full details. In addition to ASARCO's operation the following companies have extensive claim holdings and have conducted exploration in the area: Ventures Ltd., Bear Creek Mining Company, and Tintic Standard Mining Company.

The contract for the 800-foot vertical shaft at its Safford, Arizona, copper property has been awarded by Kennecott Copper Corporation to Boyles Bros. Drilling Company of Salt Lake City, Utah. Sinking operations are now on a three-shift basis. The Safford Project development shaft will have two compartments with inside dimensions of 5 feet by 5 feet, 6 inches, for one and 3 feet, 6 inches, by 5 feet, 6 inches, for the other. One station will be cut at a depth of 754 feet from the collar to permit the development of the 3,900-foot level. This allows for a 46-foot sump below that level. Another contract will be let for drifting and cross-cutting in the development of this level. Annan Cook is resident geologist in charge of the Safford Development Project for Kennecott and Sam Smyth is mining engineer.

### Kerr-McGee Drills 90-Inch Ventilation Shaft

... to make technical breakthrough to full production size shaft using special equipment at its Section 24 uranium mine at Ambrosia Lake

It took only 38 days for Kerr-McGee Oil Industries, Inc. to drill a 90-inch diameter round shaft to a depth of 710 feet at its Section 24 uranium mine at Ambrosia Lake, New Mexico. Kerr-McGee, parent company of Kermac Nuclear Fuels Corporation, moved its No. 7 drill from La Mesa, Texas for the shaft. No. 7 is a 133 foot high Lee C. Moore derrick with a National 75 drawworks.

Marion J. Bolton, Kermac's general manager, reports this new super hole drilling as still experimental, but that it appears to be competitive costwise with other sinking methods. The new shaft is lined with 1/4-inch steel casing of 72-inch inside diameter and will initially be used for ventilation. Two 125-horsepower fans mounted at the collar circulate 100,000 cubic feet of air per minute through the mine workings. The shaft was drilled and casing installed before a drift was driven from the mine workings to the bottom of the hole.

Kermac has been a pioneer in drilling shafts and its four 44-inch diameter shafts drilled early in 1960 are described in the January 1961 issue of MINING WORLD, pages 23, 24, and 25. Kerr-McGee is one of the largest contract drilling companies in the United States and it appears probable that it will undertake mine shaft contract drilling.

The adjoining picture shows the drill collar stabilizer as it was hoisted out of the hole. Note the three 42,000-pound drill collars on top of the 17,000-pound

The 500-foot vertical shaft at the Copper Queen mine of Cyprus Mines Corporation, Bagdad, Arizona, has been completed and stations cut at the 300 and 450-foot levels. The contract crew of Centennial Development Company is now preparing to crosscut to the veins on both levels. The distance is estimated at 100 feet from the shaft at the 300-foot level, and 140 feet on the 450 level. At the corporation's Old Dick mine, production continues at a normal rate, with the zinc-copper ore being mined mainly from the 650 and 800-foot levels. Shaft sinking is in progress at about 860 feet and will be continued to open a new level at 950 feet. Curtis Sundeen is resident manager, directing work at both properties.

The Century Mining Company, two miles southwest of Bouse, Arizona, is completing its manganese mill and expects to be milling very soon at the rate of 250 to 300 tons per shift, producing about 100 tons per day of concentrate. The plant consists of a 12 by 20 inch jaw crusher, 30 inch cone crusher, storage bins, screens, and heavy media plant, together with feeders, conveyors, and other equipment. A large part of the equipment was obtained from Mohave Mining and Milling Company of Wickensburg. The ore for the plant will come from the Black Mule East group of claims, about five miles northeast of Bouse, and the Black Mule West group, some six miles to the southwest. Jim Hicks of Bouse is president of the corporation; Bill T. Turner, plant superintendent; and R. S. Woodruff, engineer. Principal stockholders in the corporation, organized in 1959, are said to be Texas men.



90-inch bit. The rotary table has been stripped from rig floor and rides the top of the big string.

Hugh B. Williams Manufacturing Company of Dallas, Texas built and leased special equipment to Kerr-McGee for this shaft.

## California

### New Asbestos Mine and Mill Slated in Central California

A high-grade asbestos deposit covering 1,500 acres in the Diablo Mountain Range of central California near Coalingua will be put into production by Johns-Manville Corporation and Kern County Land Company of San Francisco. The mine and mill will be operated by a new company, Coalingua Asbestos Company, Inc., formed by the two firms, with Johns-Manville holding majority interest.

The claims and leases covering the property, 160 miles southeast of San Francisco, 190 miles northwest of Los Angeles, and at a 4,000-foot elevation, were acquired by Kern County Land.

A new asbestos mill will be built at the deposit to produce high-quality asbestos "shorts" for use in cement, asphalt and vinyl-asbestos products.

Mining at the new Coalingua mine will be by open-pitting; very little overburden will have to be stripped, and reserves assure many years of low cost open pit mining. Large quantities of ore from the Diablo Range ore body have been test milled at Johns-Manville mills in Canada with highly favorable results.

In the same area, Union Carbide Nuclear Company, has staked and acquired 100 asbestos-bearing claims in the New Idria district extending from San Benito County into Fresno and Kern Counties. Although exploration results are reportedly favorable, no mining plans have been announced.

Although mercury output in California during 1960 increased somewhat, the value was lower than in 1959 because of lower prices. Shipments of iron ore for the year were above the 1959 level, mainly because of more exports.

Drilling continues on a regular schedule at the **White Caps Gold Mining Company** beryllium property near Lone Pine, California. Recent assays from a drill core down 75 feet indicate a content of 7.6 pounds per ton in beryllium oxide.

**American Mining & Development Company**, in working the gravel pits near Oroville, California, is also washing the

gravel once more for gold. Initially the company is handling 2,000 tons of gravel a day to be used in construction of dams on the Feather River.

A guide for both the professional prospector of minerals, gems, and ores and the hobbyist in these fields has been written by Sterling Gleason of Los Angeles, California. The book, "Ultraviolet Guide to Minerals," speeds identification of rocks to a simple matter of looking up the glowing color in the appropriate section of the book's field charts and comparing the description with the specimen. Copies at \$6.95 each may be obtained from Van Nostrand Books, Princeton, New Jersey.

No major plant additions are planned by **United States Borax & Chemical Corporation** during 1961 since technological improvements at its Boron and Wilmington, California, plants continue to increase productivity. Installation of a 1,300-foot conveyor belt system at the **Boron** open pit mine was completed late last year. The mine continues to provide maximum flexibility to meet increased requirements as needed.

## Nevada

The 1960 increase in Nevada's total mineral production by some \$12,500,000 is largely due to production of copper which was up about 20,000 tons from the 1959 tonnage. Other minerals with greater output include molybdenum, zinc, uranium, silver, mercury, and iron. There was more activity in tungsten during the year as to number of properties in operation or under development, but total quantity of concentrate sold and used was lower. More flasks of mercury were produced in 1960, but value of this was slightly lower, too, because of a lower average unit price that closed some marginal operations during the year.

An exhaustive search for copper deposits is being conducted in White Pine County, Nevada, by **Bear Creek Mining Company**, exploration unit of **Kennecott Copper Corporation**, whose Nevada Mines Division has an important program of ore development surrounding its operating pits in the area.

W. H. Wathen and Archie Branch, who have been working on five lode and

placer claims for a number of years, have uncovered a gold deposit that has the appearance of a true fissure vein. The claims are located near the head of Limerick canyon in the Lovelock, Nevada area. Gold stringers were found that led into a flat vein which turned down at an angle of 70°.

## New Mexico

Contract for the 1,200-ton skip hoist for the **Santa Rita**, New Mexico, copper mine of **Kennecott Copper Corporation** was awarded to **Allison Steel Manufacturing Company** of Phoenix, Arizona, by **National Iron Company** of Duluth, Minnesota, prime contractor on the \$2,350,000 job. (See **MINING WORLD**, January 1961, page 45.) **Kennecott's Chino Mines Division** is completing the excavation of a slot 45 feet wide and about 15 feet deep from the rim to the bottom of 1,500-foot-deep pit. The new hoist will operate two counter-balanced 40-ton skips in this 30° inclined slot on tracks 12 feet wide.

Zinc mining and milling operations at Silver City and Deming, New Mexico, suspended in 1957, have been resumed. The operation is a joint venture of **American Zinc, Lead and Smelting Company with Hydrometals, Inc.**, and involves both the **Kearney and Pewabic** mines in the Silver City mining district, formerly operated by **Peru Mining Company**, a wholly-owned subsidiary of Hydrometals. **American Zinc** in 1959 acquired a 50 percent interest in these properties and has conducted an extensive surface and underground exploration program the past year which indicated a substantial tonnage of ore. The project, to be operated under the name **American-Peru Mining Company**, includes a mill at Deming, which will also mill custom ore from small mining operations in the Deming area. Concentrate produced will be smelted at the Dumas, Texas, smelter of **American Zinc**, which will also manage the New Mexico operation.

Establishment of a new processing plant so that lower grade potash deposits in New Mexico can be developed economically is under study by **United States Borax & Chemical Corporation**. The Carlsbad deposits which lie about 1,000 feet deep are of varying grade and the higher grades, in the 20 to 25 percent range, are approaching exhaustion. The lower grade deposits should have a mining life of about 25 years. Production of potash at Carlsbad during the last fiscal year has been at a record level and new mining equipment installed recently is expected to improve cost efficiency of the underground operation. Since European potash reserves are diminishing and production from Canadian sources has not yet started, expansion of the New Mexico operation may be economically feasible.

May 12, 13, and 14 are the dates selected for the Sixth Annual Uranium Symposium to be held in Grants, New Mexico, under the sponsorship of the Central New Mexico Section of the **AIME**. Clyde Osborn, section chairman, has appointed committees for the session which will include a field trip to mines and mills in the area. General symposium chairman is Harve Ashby, assistant chairman is James Greenslade, and head of the publicity committee is Donald T. Delicate.

### U. S. Steel Buys Nevada Iron Deposits

... from two companies after 12 diamond drills extended reserves that can be mined by open-pitting to about 100,000,000 tons assaying 15 percent Fe

Mineral Materials Company and American Exploration and Mining Company have sold their 16 patented and 46 unpatented claims and the dry magnetic beneficiation plant to U.S. Steel Corporation's Columbia-Geneva Division. The claims are in the Buena Vista district of northern Churchill County, Nevada.

Since 1952 Mineral Materials has mined and milled 1,200,000 tons of ore from a small pit in what is known as the West ore body in Section 4 T. 24 N., R. 34 E. Interestingly, 950,000 tons of tailing from this mill assay about 32 percent iron. This is believed to be the largest ore deposit included with the purchase, but it is known that other ore bodies have been found in Sections 1, 3, and 6 by Mineral Materials and South-

ern Pacific Company, as well as Columbia-Geneva.

Metallurgical tests on Columbia-Geneva drill cores and other samples have been conducted by the Colorado School of Mines Research Foundation. It is known that the magnetite ore (very little hematite) can be beneficiated to produce a very clean high-grade concentrate having a small amount of apatite (phosphorus), however.

Columbia-Geneva has conducted seismic geophysical surveys across the nearby Carson Sink seeking sources of water for a wet mill. Columbia is also reported as having staked additional claims to the east, north, and south, including ground between Mineral Materials and Southern Pacific.

## Minnesota Iron Executives Call For Higher Labor Productivity and Fair Taxes To Stay Competitive



MAN OF AMERICAN MINING, R. J. Linney, president of Reserve Mining Company, accepts the MINING WORLD plaque from N. A. Moberg, retiring president of the Minnesota Section of the AIME. At right is E. P. Pfeider, newly elected president of the Minnesota Section.

Continuation of the 1960 meeting's theme—"Economics of Lake Superior Iron Ores and Their Competitive Positions in the World Market"—prevailed at the 34th annual meeting of the Minnesota Section of AIME and the 23rd Annual University of Minnesota Mining Symposium held in Duluth January 9, 10, and 11.

Following the keynote address by Robert J. Linney, president, Reserve Mining Company, papers were presented which called for more basic research in both mining and mineral beneficiation. Several relatively new concepts in beneficiation were outlined such as direct reduction and froth flotation.

On Tuesday, January 10, following introductory comments on the role of education in the competitive position of the Lake Superior iron ore industry by Eugene P. Pfeider, University of Minnesota, Herbert C. Jackson, executive vice-president of Pickands-Mather & Company spoke on the future of Minnesota iron mining as related to taxes imposed upon mining firms by the state of Minnesota.

He stated that under the Minnesota tax system the iron mining companies, other than taconite producers, are paying six tax inequities and further that the state compounds the tax penalty to a point that any new development of a large-scale iron mining operation re-

quiring substantial capital would likely be discouraged unless suitable tax changes are made by the state. After presenting a solution to the tax problem he said that the willingness of the people residing in Iron Range communities to permit fair and equal tax assessments would probably be a greater incentive to economic development in Minnesota than any other single factor. William Montague, Duluth attorney, spoke on the subject of the varying effects of wage settlement as related to the iron mining industry. He pointed out that an increase in base pay is not the only item the unions should bargain for; rather, they should extend more efforts toward increasing fringe benefits.

Hugh Leach, vice-president, Foreign Operation and Ore Development, Cleveland-Cliffs Iron Company, Ishpeming, Michigan, spoke on the topic of the relationship of labor productivity and costs. He showed that wages have increased steadily over the past 10 years while in the same period of time, productivity showed some increases and some decreases. The net result of this comparison is that mining companies are spending considerably more money now to produce concentrates, even with highly significant technological advances. He felt that a practical solution to the problem was to convince the working man of the companies' need for maximum productivity

if they were to stay active in the highly competitive iron ore market.

During the afternoon sessions papers were presented which dealt with the transportation, handling and storage of iron ores after they have left the mine until they are fed to the blast furnace. Once again, economics was the general theme and it was pointed out that increases in costs of transportation, handling, or storage of iron ores could possibly degrade the already non-favorable competitive position of Lake Superior iron ore.

Speakers during this session were Carl Hussey, general manager, Northwestern Railroad, who spoke on "From Mines to Dock in the Lake Superior Region"; Fred Vines, chief engineer, the M. A. Hanna Company, who spoke on vessels; J. R. Turner, lake traffic representative, Jones & Laughlin Steel Corporation, who spoke on "From Dock to Steel Plants—Lower Lake Ports"; and J. S. Wilbur, vice-president, Cleveland-Cliffs Iron Company, who spoke on "Competitive Problems Affecting Lower Lake Railroads."

## Central

A production increase of 13 percent for lead and 6 percent for zinc in Illinois during 1960 was chiefly due to increased production from fluorspar mines recovering those two metals as byproducts. Illinois led the nation in fluorspar production, furnishing over half the total domestic output last year, according to a preliminary survey by the Bureau of Mines, United States Department of the Interior.

Several departments at the Rosiclare, Illinois mine and mill of the Aluminum Company of America went on a four-day work week in mid-January. Alcoa is reducing its production of aluminum, resulting in a decreased need for fluorspar from its Rosiclare mine. The cutback, however, means that the life of the operation will be extended longer than previously planned.

Two lead-zinc mills in the Tri-State District are being reconditioned to reopen in March after being idle about three years. American Zinc, Lead and Smelting Company will operate its Barbara J. Mill at Cardin, Oklahoma at full capacity, with an output of some 25,000 tons of ore a month by the end of the second quarter this year. Milling charges will be set as low as possible to assure maximum production. Ore will be supplied by independent lessees located within trucking distance of the mill, mainly the various mining operations under management of O. L. Green of Columbus, Kansas, and from the Helen H. Mining

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## WHAT'S GOING ON . . .

### CENTRAL AND EASTERN

Company under management of Claud R. Jones of Miami, Oklahoma. Second mill to reopen will be the Central mill of **Eagle-Picher Company** at Commerce, Oklahoma, which initially will have a milling rate of about 2,000 tons a day. The Central is the area's largest mill and at full capacity can treat 12,000 tons daily. Mine operators in December began getting mines ready for operation. Eagle-Picher has had one mill, the Bird Dog, in operation the last 18 months, but it treats only mill tailing.

At the **Pea Ridge**, Missouri iron ore mine of **Mcramec Mining Company** sinking of the No. 2 shaft had reached 1,740 feet by December, while sinking of the No. 1 shaft for hoisting men and materials had reached a depth over 2,000 feet. Although full operation is not scheduled until 1962, some 35,000 to 45,000 tons of ore have been mined during the driving of levels through the main ore body, all from Shaft No. 1 so far. Current employment at the \$40,000,000 project is about 140 men and a few more will be needed in the next six months. At full production, however, a work force of some 1,200 men is expected.

A new sulphur mine has been opened by **Freeport Sulphur Company** at Lake Pelto on the marshland shore of the Gulf of Mexico about 60 miles southwest of New Orleans. The company is using its unique barge-mounted plant formerly used at the now-depleted **Bay Ste. Elaine**

deposit. **Lake Pelto** is the second mine opened by Freeport in 1960. Its major **Grand Isle** project, the world's first offshore sulphur mine, began commercial production last June.

**Kaiser Aluminum & Chemical Corporation** will start construction within a few months on a plant to supply most of the aluminum fluoride for its reduction plants. The \$1,400,000 plant will be built adjacent to the firm's aluminum and caustic-chlorine plants at Kaiser's Gramercy, Louisiana, Works which are located on a 3,200-acre tract between New Orleans and Baton Rouge. Completion is scheduled for the third quarter of 1962. Aluminum fluoride is used with cryolite in the electrolytic process which reduces alumina to primary aluminum. The plant will use fluorspar and sulfuric acid transported to the Gramercy docks by vessel and barge, together with special alumina hydrate from the corporation's alumina plants.

## Eastern

**New Jersey Zinc Company** is drilling for a down-dip extension of its ore body at its **Jefferson City**, Tennessee zinc mine where the ore occurs in the lower Kingsport formation of the Knox dolomite. This same formation is being prospected below the lowest present level. **Joy Manufacturing Company** has the drilling contract and is using two diamond drills on the exploration project.

A change in name effective January 1 makes the **Cerro de Pasco Corporation** now the **Cerro Corporation**, a revision in line with the present scope of the firm's business and future expansion of activities. A leading United States producer and fabricator of non-ferrous metals, **Cerro** was named for the site of its first copper mine at Cerro de Pasco in Peru, where its principal mining and refining subsidiary will retain the Cerro de Pasco name.

**Vitro Corporation of America** has purchased all minority interest in its chemical subsidiary, **Vitro Chemical Company**, from **Pechiney**, French industrial chemical leader. The United States firm has also entered into a royalty agreement, extending through 1974, which gives Vitro exclusive United States and Canadian rights to all present and future Pechiney process and product patents involving rare earth chemicals, metals, alloys, and related compounds. It also provides for a mutual exchange of technical knowledge in the field between the two concerns, and covers products such as thorium, scandium, yttrium, hafnium, and zirconium compounds. Vitro Chemical, formed in 1959, manufactures inorganic chemical products for industry at its Chattanooga, Tennessee, plant.

Both theory and practice will be emphasized at the Fourth Symposium on Rock Mechanics scheduled for March 30 to April 1 at Pennsylvania State University in University Park. The meeting is under joint sponsorship of the mining departments of **Colorado School of Mines**, **University of Minnesota**, **Penn State**, and the **University of Missouri**. Four technical sessions at the conference will be devoted to: behavior of rock under static loading; behavior of rock under dynamic loading; measurement of rock

properties and stress instrumentation; and ground control and subsidence. Emphasis will be on application to problems of mining technology and science.

**Tri-State Zinc Company** has completed the diamond drilling program at **New Market**, Tennessee, which consisted of a series of vertical holes that went to an average depth of 1,400 feet. Tri-State Zinc optioned the property from **American Zinc Company of Tennessee** with the provision that a mill is to be built if a mine is developed. **American Zinc Company** is to purchase all concentrates. (See **MINING WORLD**, June 1960, page 57.)

## Iron Ranges

A record total of taconite concentrate, approximately 11,500,000 tons, was shipped from Minnesota during 1960, compared with 8,400,000 tons in 1959. Producers were **Erie Mining Company** (operating agent, **Pickands Mather & Co.**), **Reserve Mining Company**, and the **Oliver Iron Mining Division of United States Steel Corporation**.

**Oliver Iron Mining Division**, of **United States Steel Corporation**, has started stripping overburden from its **Twin City** iron ore reserve located just east of **Chisholm**, Minnesota. No shipments have heretofore been made from the mine and when it is operating it will be a small producer. Oliver engineers have estimated that 2,600,000 tons of ore are available for mining from this property.

Winter activity of **Cleveland-Cliffs Iron Company** on the **Mesabi Range** will include stripping at the **Canisteo**, **Hull-Trumbull**, and **Holman** mines. The company also intends to complete construction of the cyclone plant at **Canisteo** and of a reject conveyor and stacker system at **Hull-Trumbull**.

Operation of both underground and open pit mines of **M. A. Hanna Company** in its Michigan district and Ontario will continue during the winter season. The company plans to install a cobbing plant which will reject low grade ore by a magnetic process at its **Moose Mountain**, Ontario mill. At the **Groveland**, Michigan mine the 1961 program includes installation of new equipment in the crushing plant and of magnetic separators in the concentrator. These will remove magnetite which in the current operation is being lost in the fine tailing. The research program at **Groveland** includes operation of a small pilot plant which may be expanded. Normal winter stripping operations are scheduled at the Hanna company's Minnesota district mines, including **Hunner**, **Patrick**, **Mississippi Group**, **Pierce**, **Morton**, **Robert**, **West Cuyuna Group**, and **Douglas** mines. Plant repair projects are planned for many of these mines as well as at **Portsmouth** and **Morocco**. The company is constructing a clear water pond, wing dam and tailing basin at the **Mississippi Group**, and another tailing pond basin at the **Douglas** mine. Hanna's most important Mesabi Range project at present, the semi-taconite pilot plant at **Cooley**, Minnesota, is nearing completion with test work scheduled to begin soon. Factors that will determine the construction of a full-scale plant include development of a method to make a product that will meet grade competition, cost of such a production method, and financing.

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## Alaska

A second series of public hearings is being held during February on revisions of mining regulations in Alaska. Not as extensive as the first hearings, these are being conducted at Anchorage, Juneau, and Fairbanks. Some rather broad departures from conventional mining law have been proposed. (See *MINING WORLD*, January 1961, page 49). A redraft of the proposed regulations, which affect lands that will be owned by the state, is being sent to all who attended the first series and those who requested copies. The proposed laws will not affect claims now in existence or claims staked in the future on federal public domain land.

The diamond drill exploration program at the copper-nickel property of **Admiralty Alaska Gold Mining Company** in Funter Bay is continuing from the 200 level.

Leading mineral commodity, in terms of value produced, for 1960 in Alaska was again gold. The value of production was unchanged from 1959, arresting temporarily the downward trend of recent years. Leading producer again was **United States Smelting, Refining and Mining Company**, which conducted operations with nine dredges at Nome, Fairbanks, Chicken, and Hozata River. Yardage dredged and gold recovered were about the same as the year before.

Progress at the **Mikado** gold mine, Chandalar Mining District, this past season included 655 feet of drifts and raises. Frank E. Birch, Spokane, Washington, mining engineer, did the work under contract and brought out 300 pounds of ore samples for mill tests. The mine is owned by **Little Squaw Mining Company** of Spokane.

## Idaho

Negotiations have been completed by **Idaho Mining & Milling, Inc.** for a third dredge which will be moved from Ruby Meadows near Burgdorf, Idaho, to the firm's placer properties in the Florence Basin, Idaho County, Idaho. The new 300-ton dredge is a 2½-cubic-foot Yuba boat and will be moved over the same route as the company's 2-cubic-foot, 250-ton Yuba now in operation. Idaho Mining earlier had purchased from **Mullin Mines, Inc.** a Bodinson washing plant fed with a dragline. When it is moved from its present location at Fall Creek near Elk City, Idaho, the firm will have dredging capacity of 6,500 cubic yards of gold-bearing gravel per day. The company, which owns over 40 miles of streambed in Florence Basin, has been engaged since its incorporation in 1958 in construction of a sawmill, complete camp buildings and an airport, and the moving and installing of dredges.

**Bunker Hill Company** operations are on a six-day work week temporarily to enable the big mining and smelting firm to get back to normal operations as soon as possible following a record-breaking 7½-month labor strike. The Kellogg, Idaho, operator also wants to make up some lost production. Pre-strike production figures were 8,000 tons of pig lead and 6,200 tons of slab zinc and zinc alloy

monthly. Starting up for the first time is the firm's \$2,000,000 phosphoric acid plant, completed last July with a capacity of 140 tons of acid daily. The new contract, covering the next five years, contains the Coeur d'Alene mining district's first escalator clause tying wages to the combined price of lead and zinc.

The **Liberty Gem** silver-lead-zinc mine in the Hailey area, Blaine County, Idaho, at last report was being operated on a three-shift basis. Production was reported at more than 100 tons daily, with milling on a 60-ton-per-day basis. The property is owned by R. G. Cheney, Edmonds, Washington, and C. L. Shelton, Yakima, Washington.

**Salmon River Scheelite Corporation** has resumed small-scale production at its tungsten mine near Clayton, Custer County, Idaho, after a year's shutdown because of low tungsten prices. The four-man crew also is seeking to develop higher grade ore. Robert M. Barrett, Salt Lake City, Utah, is financing operations under a lease arrangement. Harvey Penney, Clayton, Idaho, is company president.

**General Mines Corporation** has recently cleared minor cave-ins in the mile-long tunnel at its property near Little Pine Creek in Shoshone County, Idaho. The company also installed electrical equipment for a new underground ventilation system.

A hitherto undeveloped body of silver-bearing ore, disclosed by diamond drilling, is being developed in the Chester fault zone on the 4,000-foot level of the **Sunshine** mine, Coeur d'Alene mining district, Shoshone County, Idaho. The

structure is showing better-than-average width and grade. A limited ore shoot of good grade and width also has been disclosed by diamond drilling and drifting in the hanging wall of the Syndicate fault. A new offset shaft in the east end of the mine has been sunk a short distance below the 4,000 level and at last report was being raised to the 3,700 level. A sand-fill system was scheduled to go into operation by year's end. Most of the rubber-lined supply line has been installed in the Jewell shaft and a major portion of surface installation, including the main sand tank, has been completed. The **Sunshine** mill handled an average of 19,165 tons of ore monthly in 1960.

## Montana

Electrolytic zinc production of **The Anaconda Company** in Montana has been consolidated because of high operating costs, low zinc prices and reduced supplies of ore and concentrates. The company has closed the last two of its six zinc processing units at Anaconda, and reopened one unit at Great Falls, so that six of the 10 units there are now in operation. Full capacity at Anaconda is about 86,000 tons per year, and that of Great Falls is 162,000 tons.

The **Texmont Mining Company** is exploring and developing the Bell property and mines near the old Bell holdings in Baker, Montana. Initially the work consists of exposing some parallel veins to the Bell vein by surface cuts and trenches.

Exploration work to be carried out by **Northern Milling Company, Inc.**, under a recent OME contract for \$102,300 calls



**Packaged Perlite Shipped From New Idaho Mine**

Oneida Perlite Corporation's new perlite mine, crushing and sizing mill, and expansion plant have been completed in Oneida County, Idaho. The new company, founded and controlled by Malad City business men, has been built in less than a year and is a completely integrated operation from mine to expanded perlite at a 30-ton-per-hour capacity. The picture above shows the crushing and drying mill at the mine 25 miles from Malad City. A few feet of overburden is bulldozed off the ore body and the ore is then mined by front end loaders and trucked to the mill. The ore is crushed, dried to about two percent moisture, and screened into six fractions each of which is stored in its respective cylindrical bin shown in the picture. The sized ore is drawn from bin and trucked to Malad City where the "popping" plant is located. The expanded perlite is packed in bags and shipped to markets under the trade name of Perlor. Company president is Marion J. Hess, Udell Champneys is vice president, and Fred Lindenmayer is in charge of expanding operations.

# Metal & Mineral Prices

# U. S. A.

January 20, 1961

## METALS

<b>COPPER:</b> Electrolytic, Delivered F.o.b. cars, Valley basis (pound)	29.00c
Lake, Delivered, destinations, USA	29.00c
Foreign, Delivered, destinations, USA	29.00c
<b>Lead:</b> Common Grade, New York (Per pound)	11.00c
Tri-State Concentrate, 80% lead, per ton	\$125.16
<b>ZINC:</b> Prime Western: F.o.b. E. St. Louis (Per pound)	11.50c
Prime Western: Delivered New York	12.00c
Tri-State Concentrate, 60% zinc per ton	\$68.00
<b>ALUMINUM:</b> Primary 50 Pound Ingots (99.5% plus) (Per pound)	26.00c
<b>ANTIMONY:</b> Lone Star Brand, F.o.b. Laredo, in bulk (Per pound)	29.00c
<b>BISMUTH:</b> (In ton lots) price per pound	\$2.25
<b>CADMIUM:</b> Sticks and bars, 1 to 5 ton lots Price per pound	\$1.60
<b>COBALT:</b> 97-99%, keg of 500 pounds (Price per pound)	\$1.50
<b>COLUMBIUM:</b> Ingot	Nominal, per pound \$36.00-\$35.00
<b>GERMANIUM:</b> dioxide, high purity, gram	16.75-21.75c
<b>LITHIUM:</b> 98% (per pound)	\$9.00-\$12.00
<b>MAGNESIUM:</b> Ingots (99.8%) F.o.b. Velasco, Texas per pound	36.00c
<b>MERCURY:</b> Flasks, Small lots, New York	\$208.00-\$210.00
<b>NICKEL:</b> "F" Ingots (5 pounds) F.o.b. Port Colborne, Ontario	75.50c
<b>PLUTONIUM:</b> To July 1, 1962 AEC will pay \$30.00 to \$40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram	\$30.00
<b>SELENIUM:</b> 99.5% per pound	\$6.50-\$7.00
<b>TELLURIUM:</b> Common grade, Per pound	\$4.00
<b>THORIUM:</b> per kilogram	\$43.00
<b>TIN:</b> Grade A Brands, New York (Per pound) Prompt delivery	100.875c
<b>TITANIUM:</b> 99.3% + Grade A-1 Sponge (Per pound)	\$1.50-\$1.60
<b>URANIUM:</b> Rod (0.790 U-235) \$16.00 Per Pound; Foil	\$16.75
U-235: Nominal (Per pound)	\$7.25
<b>VANADIUM:</b> 90% Grade	\$3.45
<b>GOLD:</b> United States Treasury Price	\$35.00 per ounce
London	\$35.34 per ounce
<b>SILVER:</b> Newly mined domestic, U.S. Treasury price per ounce	90.5c
Foreign Handy Harmon	91.3c
<b>PLATINUM:</b> Per ounce	\$82.00-\$85.00
<b>ZIRCONIUM:</b> Sponge, Per pound, Reactor Grade	\$5.00

## ORES AND CONCENTRATES

<b>BERYLLIUM ORE:</b> 10 to 12% BeO, F.o.b. mine, Colorado	\$46.00 per unit
Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at \$400.00 per short ton or by assaying at 8.0 to 8.9% BeO, \$40 per unit; 9.0 to 9.9%, \$45; over 10.0%, \$48.00.	
<b>CHROME ORE:</b> F.o.b. railroad cars eastern seaports. Dry long tons.	
African (Rhodesian). 48% Cr <sub>2</sub> O <sub>3</sub> . 3 to 1 ratio	\$35.00-\$36.00
African (Transvaal). 48% Cr <sub>2</sub> O <sub>3</sub> . No ratio	\$26.00-\$28.00
Turkish, 48% Cr <sub>2</sub> O <sub>3</sub> . 3 to 1 chrome-iron ratio	Nominal \$36.00-\$37.00
U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.	
<b>COLUMBIUM-TANTALUM ORE:</b> Per Pound Pentoxide, Nominal	\$1.10
<b>IRON ORE:</b> Lake Superior. Per gross ton Lower Lake Ports	
Mesabi, Non Bessemer, 51.5% Fe	\$11.45

<b>Mesabi, Bessemer, 51.5% Fe</b>	\$11.60
<b>Old Range Non Bessemer</b>	\$11.70
<b>Old Range Bessemer</b>	\$11.85
<b>Lump: Plus 1/2-inch</b>	\$12.85
<b>Fines: Minus 1/2-inch</b>	\$10.72
<b>Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit</b>	24.00-25.00c
<b>Brazilian, Atlantic Port, 68 to 90%, Long ton unit</b>	22.00-25.00c
<b>MANGANESE ORE: Metallurgical grade. 48 to 50% Mn Long ton unit</b>	
Metallurgical grade. 46 to 48% Mn. Long ton unit	\$0.95-\$1.00
Metallurgical grade. 44 to 45% Mn. Long ton unit	\$0.90-\$0.95
Domestic U.S. Government, GSA Basis \$2.30 per unit for 48% Mn.	\$0.85-\$0.90
<b>MOLYBDENITE CONCENTRATE: 90% MoS<sub>2</sub>. F.o.b. Climax, Colorado. Per pound Mo, plus container cost</b>	\$1.25
<b>TUNGSTEN CONCENTRATE: Domestic. 60% WO<sub>3</sub> Per short ton unit</b>	
Foreign: 65% WO <sub>3</sub> Per short ton unit (Scheelite)	Nominal \$24.00
Foreign: South American, Spanish, Portuguese	Nominal \$23.50
<b>URANIUM ORE.</b> F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is \$1.50 per pound of U <sub>3</sub> O <sub>8</sub> in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.	

## NON-METALLIC MINERALS

<b>BARITE:</b> Oil well drilling. Minimum 4.25 specific gravity, per short ton	\$16.00
<b>BENTONITE:</b> Minus-200mesh. F.o.b. Wyoming. Per ton, carload lots	\$12.50
Oil Well grade. Packed in 100 pound paper bags	\$14.00
<b>BORON:</b> technical grade F.o.b. Boron California. Per ton	\$47.50
<b>FLUORSPAR: Metallurgical grade. 72.5% effective CaF<sub>2</sub> content</b>	
per short ton F.o.b. Illinois-Kentucky mines	\$37.00-\$41.00
Mexican. 70% F.o.b. border, dry paid	\$26.00-\$27.8c
<b>Acid Grade, 97% CaF<sub>2</sub> Bulk, F.o.b. mine</b>	\$45.00-\$49.00
<b>PERLITE:</b> Crude: F.o.b. mine per short ton	\$3.00 to \$5.00
Plaster grades. Crushed and sized. F.o.b. plants	\$7.00 to \$9.00
<b>SULPHUR:</b> Long ton, F.o.b. Haskins Maund, Texas	\$22.50-\$23.50

## London

January 20, 1961

	Per Long Ton	USA Equivalent cents per pound
<b>COPPER:</b> Electrolytic spot	£222	5s 0d 27.78c
<b>LEAD:</b> Refined 99%	£ 64	1s 0d 8.09c
<b>ZINC:</b> Virgin, 98%	£ 79	1s 0d 9.97c
<b>ALUMINUM:</b> Ingot, 99.5%	£186	0s 0d 23.25c
<b>ANTIMONY:</b> Regulus, 99.6%	£210	0s 0d 26.25c
<b>TIN:</b> Standard, 99.75%	£784	10s 0d 98.06c
<b>TUNGSTEN:</b> Long ton unit	£ 0	150s 0d \$21.00c

\*With Sterling Pound at \$ 2.80

Quotations on metals and certain ores through the courtesy of American Metal Market, New York, N. Y.

## WHAT'S GOING ON . . .

### NORTHWEST

for driving the Mason tunnel to intersect several veins on the Marietta mine property. (See MINING WORLD, September 1960, page 38.) The Mason tunnel is several hundred feet lower in elevation than the lowest workings at the mine, located about 15 miles west of Townsend in Broadwater County, Montana.

A new, 2,400-zinc block measuring about 3 by 3 by 10 feet, produced at the Great Falls, Montana, electrolytic refinery of The Anaconda Company, was put on the market recently. The blocks, of special and high grade zinc, can be easily shipped and stacked as high as 10 units, thus requiring only about 9 square feet of warehouse space for 24,000 pounds of zinc.

Production of several nonmetals in Montana increased during 1960, including fluor spar, mica, phosphate rock, and pyrite. Two new phosphate rock mines were under development during the year, one of them scheduled to start production this year using a mechanical planer devised by the U. S. Bureau of Mines for underground phosphate mining.

## Oregon

Emerald Empire Mining Company, a new corporation in Corvallis, Oregon,

has acquired the rights and title of Kenneth O. Watkins in the Bohemia mining district southeast of Cottage Grove, Oregon, and all his mining rights in the Blue River district east of Eugene, Oregon. The firm has also leased most of the other claims in the Bohemia district for a total holding of 210 claims covering 12 mines that produced in the past. These include the Champion, Musick and Helena mines in the Bohemia district and the Cinderella, Great Northern, and Great Eastern mines in the Blue River district. Development plans of the company call for driving a 3,000-foot drift on the Musick vein 300 feet below the old production level, and a 1,600-foot drift under old workings at the Helena mine. At the Cinderella mine, Emerald Empire has located a free gold ore shoot, about 600 feet south of the old stopes. Ore is stockpiled for shipment when weather permits next spring. Although the Cinderella and other Blue River district mines produced some good ore in previous operations, there has been no appreciable production for over 40 years.

Some of the old workings at the E & E and North Pole mines near Bourne, in Baker County, Oregon, have been reopened by T. D. French and associates, who have also revamped the old mill.

At least 45 sodium prospecting permits covering 96,000 acres are in effect in Alvord Basin, Harney County, Oregon, and four, covering nearly 11,000 acres, in neighboring Lake County. Mojave Mining and Milling Company of Wicken-

burg, Arizona, and Boron, Inc., have been most active in drilling test holes. About 1900, borax was harvested commercially from crusts formed on the surface of Alvord Valley.

## Washington

Northwest Magnesite Company, No. 1 United States producer of magnesite, has suspended production indefinitely and furloughed 150 workers pending improvement in orders from the steel industry. Howard Ziebell is general manager of the firm's large quarrying and processing operations at Chewelah, Stevens County, Washington.

An extensive diamond drilling project proposed next spring is to determine the extent of beryl-containing pegmatite dikes on Calispel Peak, northeast of Chewelah, Stevens County, Washington. Beryl crystals several inches in circumference were found in bulldozer exploration by Loyal F. Bailes of Seattle and Harold Hightower of Inchelium, Washington. Hightower and Bailes have taken a lease and purchase option on claims located by Earl Cannon of Chewelah, and staked adjoining ground. Cannon is credited with Washington's only beryl production—a few hundred pounds—from the area in 1952. Presence of beryllium on the property was confirmed by the U. S. Bureau of Mines' mobile spectroscopic laboratory on wheels and a more extensive check is planned next season.

## Colorado

### 1961 Expansion at Climax Keyed to Molybdenum Demand

To meet the greatest demand for molybdenum in its history, Climax Molybdenum Company of Climax, Colorado, will undertake this year the most extensive development program yet scheduled. The company plans to add 3,000 tons per day to its 1960 daily production of 32,221 tons by 1963 and expand milling facilities accordingly.

Highlights of the 1961 program will be increased development of the lower level production area served by its No. 4 shaft, sinking of No. 5 shaft from the Storke Level service yard area and intensified exploration of the Ceresco Ridge, which, if production proves practical, is expected to produce 5,000 tons per day by 1965.

Climax has recently awarded Boyles Bros. Drilling Company of Salt Lake City, Utah, the contract for driving an exploration adit under Ceresco Ridge, where more than 10,000 feet of diamond drill hole has been drilled during the last year to determine distribution and content of the low grade mineralization.

Latest surveys by the company indicate proven ore reserves at Climax are more than 450,000,000 tons of ore containing some 2,000,000,000 pounds of recoverable molybdenum with a value of about \$3,500,000,000 at current prices. Last year the by-product operation recovered 0.109 pound of tungsten per ton of ore milled.

A new product developed by the company is an alloy of 85 percent tungsten and 15 percent molybdenum, in the form of ingots up to 11 inches in diameter. Used as nozzles for missiles, missile vanes, and trajectory controls, the Climax product is a full density alloy which will withstand temperatures over 5,500° F. and is reportedly the only ingot available commercially in such sizes.

Improvement of milling facilities scheduled includes an increase in tertiary crushing facilities, addition of a new molybdenite concentrate drier, improvement of regrind plant facilities, and tailing delivery methods.

Value of metals production in Colorado during 1960 increased 30 percent resulting from a \$29,100,000 gain in the value of molybdenum, vanadium, uranium, and lead output.

**Transmount Mining Ventures, Inc.** of Colorado Springs, Colorado, has begun shipping ore from a new tungsten mine five miles north of Lake George, Colorado. According to George M. Ernst, vice president, first production from the mine assayed 14 percent and the firm hopes for an over-all average content of 5 percent. Operations began early in November and the first carload of ore was shipped later that month. Tungsten is comparatively rare in the Colorado area, although some low-grade deposits occur in the Boulder region.

Geology and ore deposits of the Summitville district, San Juan Mountains, Colorado, are described in Professional Paper 343, published by the **United States Geological Survey** and prepared by T. A. Steven and J. C. Ratte. The 70-page illustrated booklet, covering a district that has produced about \$7,500,-

000 worth of gold, copper, silver, and lead, is available for \$2.00 from Survey offices at 438 New Customhouse, Denver, Colorado, or from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

## South Dakota

Establishment of a mining translation center is proposed by the mining engineering department of the **South Dakota School of Mines & Technology** at Rapid City. Such a center would collect all existing translations of literature on mining engineering and related subjects, organize and stimulate a translation program using individual scientists and professional translators as necessary, issue lists of translations periodically, and make translations available to subscribers in the form of mimeographed copies or microfilms. Persons interested in the proposed plan are asked to communicate with Professors Edwin Oshier or Herbert Weisz at the School of Mines.

**Lithium Corporation of America, Inc.**, of Minneapolis, Minnesota, has received an OME contract amounting to \$26,640, for beryllium-columbium-tantalum exploration near Custer, South Dakota.

## Utah

The contract for design and construction of **Texas Gulf Sulphur Company's** potash processing plant near Moab, Utah, has been awarded to **Stearns-Rogers Manufacturing Company** of Denver, Colorado, the country's principal designer of this type of plant. Cost of the plant, which will produce muriate of potash granules for use in the fertilizer industry, will be between \$25,000,000 and \$30,000,000. It is scheduled to be in full operation early in 1962. Meanwhile, Texas Gulf is nearing completion of the eight-inch core hole at the **Cane Creek** deposit south of Moab where it acquired several thousand acres of rich potash land in an agreement with **Delhi**

**Taylor Oil Corporation.** The hole is being drilled through very hard limestone to about 2,700 feet, from which depth a four-inch core will be taken. Later the hole will be deepened to 3,500 feet for more extensive formation examination. The pilot hole is at the site of the proposed main mine shaft. (See **MINING WORLD**, December 1960, page 39.)

Patent rights to an acid process for production of high grade molybdenum oxide used as an alloying agent in steel were granted recently by the United States Patent Office to **Kennecott Copper Corporation.** Inventors are S. R. Zimmerley, director of research at Kennecott Research Center in Salt Lake City, Utah, and E. E. Malouf, project development engineer. The new process is particularly suited to treatment of lower grade molybdenite concentrates than can be treated by present processes. It permits recovery of high purity molybdenum oxide together with valuable byproducts which might be contained in the starting material. By the Kennecott method, molybdenite concentrates are roasted for partial elimination of sulphur, then the roasted product is reacted with sulfur acid at about 700° F in a rotary furnace to solubilize the molybdenum. That product is then treated with water and the solution separated from the insoluble worthless residue. A high purity molybdenum oxide can be recovered by treating the solution with an ion exchange process or reacted with organic chemicals. The oxide can then be further treated to produce a high purity molybdenum metal which has a potential use in super alloys.

**Federal Resources Corporation** of Salt Lake City, Utah, has acquired the controlling interest in the **Col-U-Mex Uranium Corporation** of Albuquerque, New Mexico, which has mining claims in the Big Indian uranium district of northern San Juan County, Utah, as its principal assets. These claims are adjacent to the **Big Buck** mine of **Standard Metals Corporation** and are operated by that firm. Ore from these properties is currently being shipped to the **Texax-Zinc Minerals Corporation** uranium mill at Mexican Hat, Utah.

## Standard Metals Cuts Split of Washington Vein

... by diamond drilling from breast of American Tunnel driven 350 feet under water-filled workings of Sunnyside mine's "I" level at Silverton, Colorado

The AX size drill bit cut through the hanging wall split from a special station below the old mine workings deep in the San Juan Mountains. The Washington vein had been mined down to I level through winzes and shafts many years ago by the United States Smelting, Refining and Mining Company.

Standard Metals Company had enlarged the old American Tunnel and extended it to a total length of 10,000 feet to develop the Washington vein below old workings through which mining and pumping had become too costly for continued operation.

True width of this split where drilled was 10 feet with four feet showing heavy sulphides. The core over the full width showed 0.02 ounce gold, 2.0 to 3.0 ounces silver, and 3.0 to 4.0 percent of both lead and zinc per ton. Standard officers knew that the vein split on I level and found its downward projection within a few feet of where expected. The drill hole

was continued into waste after cutting the vein and within a few feet drilled into the footwall split a few inches where a heavy flow of water stopped drilling. Measurement of water level in the old Sunnyside workings shows that water is being lowered by the drill hole and through a fault cut 300 feet from the breast. The tunnel is handling 2,500 gallons per minute with ease.

It is anticipated that the footwall split will be higher grade on American level because it was on the higher levels. The Sunnyside has produced about 1,800,000 tons of complex sulphide ore averaging close to 0.06 ounce gold, 2.6 ounces of silver, 1.15 percent copper, 3.1 percent lead, and 3.32 percent zinc per ton.

Standard Metals established a new surface plant at the portal of the American Tunnel, enlarged the old tunnel for a distance of 4,500 feet and then drove a new tunnel 5,500 feet to cut the vein.

# Savings in engine costs alone make the "Euc" C-6 today's best tractor buy

In the Euclid C-6 you get the advantages of job proved power train components . . . the reliability of the GM 6-71 engine, Allison Torqmatic Drive and Euclid's famous planetary drive . . . that help keep downtime to a minimum. You get designed-in service accessibility that's unsurpassed by any competitive crawler . . . servicing or complete removal and replacement time is well below that required for comparable tractors.

You get a big advantage, too, in the lower cost of engine replacement parts . . . savings that cut your maintenance expense to the absolute minimum. For example, pistons and rings for two competitive engines are 79% and 163% higher in cost than for the GM engine; a water pump 255% and 257% more; up to 120% more in replacement of complete engine from fan to flywheel.

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*Full-power shift . . . fast-as-a-fox  
maneuverability . . . and greater  
over-all work-ability!*



Have your dealer give you all the facts and figures on the C-6 . . . you'll find that in production and maintenance cost this "Euc" gives you a better return on investment.





**C-6 service accessibility  
cuts replacement labor costs, too!**

Assuming good shop conditions and experienced personnel, these are typical times for removal and replacement of components in the C-6 and other torque converter tractors of the same class:

Component	C-6	Man-Hours
Radiator . . . . .	3	Others
Engine . . . . .	8	10
Clutch . . . . .	none	16
Drive Sprocket . . . . .	8	16
Track Frame . . . . .	3*	9.8**
		8**

\*requires 70 ton press only  
\*\*requires special tools and 100 ton press

**HOURS SAVED IN THE SHOP MEAN MORE WORK-TIME ON THE JOB!**



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FOR MOVING EARTH, ROCK, COAL AND ORE

## WHAT'S GOING ON . . .

### ROCKY MOUNTAIN

Majestic Oil and Mining Company and Bogdanich Development Company have joined in a venture to develop the Bawana copper ore body near Milford, Utah, and modernize a 350-ton-a-day mill at Milford. Majestic is to provide \$200,000 for the project and share equally with Bogdanich any profits from the copper prospect. The latter has a lease on the property from Cerro Verde Mining Company which will receive royalties of six percent. Twelve core holes have been drilled into a deposit which has an estimated 300,000 tons of ore that averages 3½ percent in copper values, with some gold and silver. The copper deposit is a metamorphic type with ore found in veins with a 60-degree pitch. Plans call for concentration of both sulphide and oxide copper ores in the same circuit, a process that has been successfully tested in other operations. Two Salt Lake City, Utah, firms, Booth Engineering and Techmanix Corporation, have developed a method of "sulphidization" of the oxides so that copper values in those ores can be subsequently recovered in the concentrating process along with the values in the sulphide ores. The firms involved in the Bawana project anticipate production of a 40 percent concentrate which may be sold to the American Smelting & Refining Company smelter in Tacoma, Washington, or The Anaconda Company smelter in Anaconda, Montana. Magnetic iron concentrates, running 60 to 65 percent Fe, may also be produced from the ore.



### Koehring Skooper at Colorado Uranium Mine

To dig and load the sedimentary ore from the bottom of this open-pit uranium mine near Maybell, Colorado, Trace Elements Corporation uses a Koehring Skooper. The Skooper combines a hydraulic crowd with a 24,000-pound force and a 42° bucket rollback. Trace Elements is a subsidiary of Union Carbide Nuclear Corporation and mines low grade uranium ore from a number of open pits for treatment in its central ion exchange mill. A. W. Woods is mine superintendent.

Utah Construction & Mining Company mined and shipped 683,515 tons of iron ore from its Iron Springs mine near Cedar City, Utah, during fiscal 1960, compared with 598,128 tons for 1959. Virtually the entire output is committed to filling a 7,000,000-ton sales contract with the Columbia-Geneva Division, United States Steel Corporation. The contract extends into 1968. Earnings from this source during the company's fiscal year were up about 17 percent from the previous year. Utah is currently installing a \$1,300,000 beneficiation plant

at Iron Springs to improve quality control and utilize ore reserves more efficiently.

## Wyoming

Shaft sinking is on a 'round-the-clock basis at the multi-million dollar trona project of Stauffer Chemical Company near Green River, Wyoming. The 16-foot manway shaft has been sunk and concrete lined to a depth of over 100 feet while sinking of the combination production and ventilation shaft has started following pouring of the concrete collar. This second shaft is 20 feet in diameter, with two compartments. Permanent hoist houses for the two shafts were near completion in January and foundations for the hoists installed. The railroad bridge being built a mile west of the plant site will have a highway decking for road traffic between the plant and Green River 21 miles distant. Prime contractor for the \$22,000,000 project is Winston Bros. Company of Minneapolis, Minnesota.

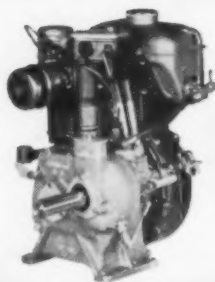
Extension of a uranium concentrate purchase contract between the Atomic Energy Commission and Susquehanna Western, Inc. provides for purchase of U<sub>3</sub>O<sub>8</sub> valued at approximately \$47,000,000 through December 31, 1966, with 1,503,000 pounds to be delivered between June 1, 1960 and April, 1962, and 4,272,000 pounds deliverable after that date. Pre-1962 price is \$8.635 per pound, and after that, \$8.00 per pound. The contract calls for operation of the Susquehanna-Western mill at Riverton, Wyoming, to operate at approximately its present rate of 500 tons per day. The contract limits purchases of ores to fulfill the contract from eligible properties in accordance with AEC allocations. The firm is a subsidiary of the Susquehanna Corporation of Chicago which operates another uranium mill at Edgemont, South Dakota, and is building a third in Karnes County, Texas.

The rapidly expanding trona mining industry near Green River, Wyoming, shipped 9,559 railroad carloads of trona products during 1960. Current producer of trona in the area is Intermountain Chemical Corporation, subsidiary of Westvaco Division of Food Machinery and Chemical Corporation.

## BIG JOB... SMALL ENGINE?

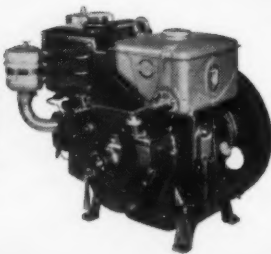
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4-Cycle — WATER-COOLED  
— Single Cyl. 2 to 8 BHP  
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# PRODUCTION EQUIPMENT preview

FOR DATA ON ANY ITEM IN THIS SECTION PLEASE USE INQUIRY CARD

## Largest Production Truck In the World Carries a 95-Ton Payload

Following a year of intensive engineering, construction, and testing, the KW-Dart Truck Company has presented its new, 95-ton payload truck to the mining industry.

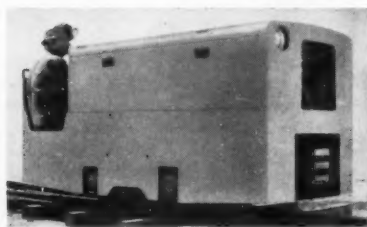
In line with the trend, the huge machine is a tractor-trailer combination. The Diesel engine is a four cycle V-12 engine rated at 700 horsepower. It is the most powerful internal combustion Diesel engine ever developed for use in wheeled construction and mining equipment. Weight of the engine is 5,700 pounds, giving a horsepower to weight ratio of 8.1 pounds per horsepower. The vehicle tractor-trailer and body has a combined unladen weight of 120,000 pounds, thus permitting a payload of 190,000 pounds.

The frame is unique in mining service. It is made of four heat treated, pressed steel channels. Steel used has elastic limit of 110,000 pounds per square inch. They are bolted together back to back, in pairs, forming an I beam. The rails are variable in section depth, the greatest depth coming at the point of greatest stress. This construction was responsible for a sizable saving in the tare weight of the vehicle.

Until recently the limiting factors in increasing vehicle tonnage have been the horsepower requirements and tire capacities. The dual tires used on the rear wheels of the



tractor and trailer are 21:00 by 35 tubeless, 36 ply nylon cord. The front tires are 18:00 by 33, 32 ply tubeless nylon. According to the tire manufacturer, the rims are the largest demountable rims ever used. Circle No. 6.



### Diesel Mine Locomotive

A new series of Diesel mine locomotives in capacities from 2½ to 25 tons has been developed by the Greensburg Division of National Mines Service Company. According to the manufacturer, these are the simplest to maintain and operate Diesel locomotives ever built.

The new units have air or water cooled Diesel engines driving through a torque converter to a constant-mesh, double-reduction gear type main transmission with power reversing. Circle No. 35.

### Two-Way Radio Transmitter

Motorola has introduced the first fully transistorized FM radio transmitter to operate on standard VHF two-way mobile communications frequencies.

The "Handie-Talkie" pocket transmitter is completely self-contained, including microphone, antenna and batteries. Two antennas are available—a solid steel whip and a collapsible whip antenna. The pocket transmitter weighs just 14½ ounces, and measures 5½ inches by 2½ inches by 1⅛ inch. Eleven transistors in the various stages of the unit provide high reliability, low power consumption characteristics and compactness. Circle No. 5.

### Woven Carcass Conveyor Belt

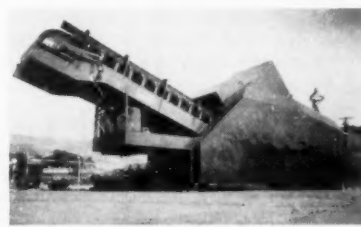
A new woven carcass rubber conveyor belt, which withstands abuse far beyond conventional ply-type belting has been introduced by the Goodyear Tire & Rubber Company.

Earmarked for long life in rugged industrial and hard-rock mining service, the new product, called Industrial Uniflo, offers previously unknown resistance to cuts and tears. The new belt is especially adaptable for iron ore and hard rock mining because of its capacity to be vulcanized into an endless unit in the field. The new Uniflow belt is the first woven carcass belt to successfully offer this capacity. Circle No. 3.

### Epoxy Saves Compressor

The cracked water-jacket casing of an ammonia compressor was repaired recently for only \$11.20 by one of South Africa's leading engineering firms, Rance, Colly and Company (PTY) Ltd. of Johannesburg. Repairs were made with Plastic Steel, a modified epoxy, which saved an estimated \$1,300 in labor and materials plus considerable down-time.

According to Devcon Corporation, Danvers, Massachusetts, the manufacturer of Plastic Steel, the same repair could be made on mine compressors. The modified epoxy, composed of 80 percent powdered steel and 20 percent plastic, is mixed with hardener just before using. Applied with a putty knife, it cures without heat or pressure into a solid mass that can be machined. It can also be used to make emergency and maintenance repairs on pumps, valves, piping, castings and other tools. Circle No. 16.



### High Tonnage Mobile Loader

Western Conveyor Company has introduced into its line of equipment a high tonnage mobile loader which is capable of pouring 3,500 tons of material per hour into hauling units.

The unique features of the new model loader are a continuous running belt and internal hydraulically-operated gate control and feeder. The positive hydraulic cut-off prevents spilling of materials, and the running belt eliminates shear and starting load. Circle No. 33.

### Rechargeable Flashlight Cell

A new rechargeable flashlight battery cartridge is announced by Gould-National Batteries, Inc. The Gould NICAD cartridge which fits all "D" two cell flashlights has a removable cap which permits recharging in any A.C. 110-volt outlet.

The manufacturer claims a minimum of 250 recharging cycles and that each charge gives 50 percent more continuous light than the average flashlight battery. On this basis the cartridge would pay for itself after 60 rechargings and would save the cost of 190 sets of standard "D" cells. Circle No. 1.



### Lightweight Diamond Drill

For most capacity per dollar and most capacity per pound, the Winkie diamond core drill delivers 2,000 rpm at the bit, and has a 200 foot capacity recovering 15/16-inch cores in hardest granite. This versatile, 45-pound machine will drill at any angle, is set up and working in five minutes, and is operated by only one man.

The Winkie is field-proved on all types of core drilling operations and sells for half the cost of drills with comparable capacity. Circle No. 11.

### Truck Alarm Bell for Safety

Warn-A-Larm, a new gravity actuated mechanical back-up alarm which rings in reverse only, is now being manufactured by the Warn Sales Company of Seattle, Washington.

Designed for easy installation on the rear wheels of trucks, the Warn-A-Larm sounds a loud, clear warning four times with every revolution of the wheel in reverse. It is gravity operated by striker balls that strike the rim of a 6-inch diameter chrome plated steel bell. Sound volume peaks within the critical five-foot danger zone behind a vehicle, but is approximately 80 percent as audible at 100 feet. The alarm is silent in forward motion. The Warn-A-Larm can be mounted on either back wheel with special mounting brackets. Circle No. 23.

### Engine Maintenance Lab

The first commercial chemical laboratory designed especially for the scientific control of engine maintenance has been established in Oakland, California.

Analyst's Inc. offers a complete laboratory and consultant service to the transportation and mining industries for preventive maintenance of internal combustion engines. The new firm examines an engine's lubrication oil for trace amounts of wear metal, compares the results with established standards and, from this information, pinpoints trouble spots in the engine before extensive damage occurs. Circle No. 19.

### Crusher With One Moving Part

"Pulvo-Matic," a new type of rock reducer, will crush all types of rock for aggregate or can be used to crush limestone and ores requiring lumps of specified sizes. The aggregate sizes are accurately controlled and are not affected by the wear and tear of hammers, jaws, rolls, etc. The only moving part is a rotor cage of cast manganese steel, which works in conjunction with manganese-steel liner or breaker plates. This new crusher is manufactured by The Frog, Switch and Manufacturing Company of Carlisle, Pennsylvania. Circle No. 83.

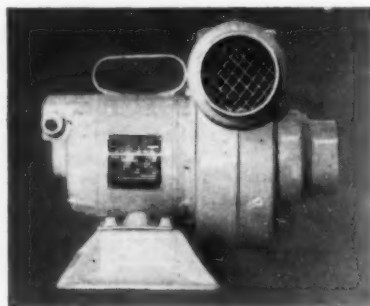
### Waterproof Fuse Ends

A new protective enclosure for preserving the effectiveness of detonating fuse by preventing water absorption in wet blast holes is announced by Austin Powder Company. Known as Austin Plastic Fuse Enclosure, it is recommended for sealing all fuse ends in bottom or top of wet holes. Its use is particularly important in bottom charges where water problems may affect final results. Circle No. 2.

### Nine-Speed Transmission

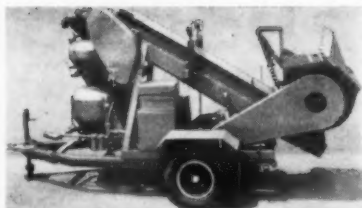
A new, nine-speed transmission for extremely heavy-duty off-highway and industrial applications has been announced by Fuller Manufacturing Company.

Providing nine closely-spaced forward gear ratios selected with a single shift lever, the Fuller R-1750 Road Ranger transmission features pressurized jet spray lubrication system for the operating gear teeth, pressurized lubrication for the mainshaft mounted gears, and a countershaft inertia brake which makes quick upshifts possible without double clutching. Circle No. 20.



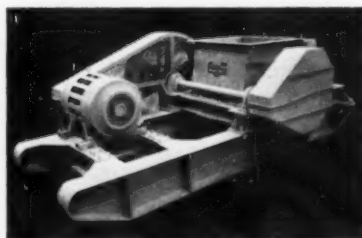
### Portable Pressure Blowers

New, portable pressure blowers, made by Manhattan Electric and Maintenance Company, Brooklyn, New York, are exceptionally compact and light in weight. Designed as ventilating units for removal of fumes and dust, for furnishing fresh air in confined work areas, or for supplying air under static pressure to boilers and ovens, they are constructed for continuous service, indoors or out, and are both waterproof and vaporproof. Circle No. 24.



### Underground Guniting Rig

Mine and tunnel crews can now roll a compact new guniting plant right into underground work areas and shoot their own concrete into place at the rate of six to twelve tons an hour. Designated as Model C-3 UG, the unit was developed by Ridley & Company, Inc., of Los Angeles, California, and is six feet high with a base five by ten feet. Circle No. 27.



### New Skid-Base Crusher

A new skid-base crusher which is movable for following underground mining operations has been introduced by McLanahan and Stone Corporation. The unit includes a self-contained 100 horsepower motor and a 36-by 48-inch Black Diamond single roll crusher mounted on a heavy-duty, skid-type base. Circle No. 82.

### Air Powered Bit Grinder

Bitco, Inc. of Spokane, Washington, has developed a new pneumatic powered rock bit grinding machine that has performance comparable to a three-quarter horsepower electric unit. The manufacturer claims three advantages for the machine in mining and construction work. These include dressing bits at the drilling site, power is always available at the compressor, and the pneumatic motor has a wide variation in speeds. Circle No. 15.

### Ground Geophysical Surveys

A ground geophysical surveying department to support and amplify airborne geophysical findings with appropriate ground follow-up surveys has been formed by Fairchild Aerial Surveys, Inc., a wholly owned subsidiary of Fairchild Camera and Instrument Corporation. The survey to be offered by the new department will include ground magnetics, ground electromagnetics, AFMAG, radioactivity, and refraction seismographs.

The new department will be under the direction of W. C. Kellogg, Chief Geophysicist for Fairchild. Circle No. 25.

# MORE NEW EQUIPMENT . . . AND NEW LITERATURE

**DIESEL GENERATOR** sets for continuous or emergency power by Allis-Chalmers are quick starting, easy to install, and offer unequaled electrical reliability. For complete information circle No. 37.

**YIELDABLE STEEL ARCHES** for underground support are described in a 12-page bulletin released by the Commercial Shearing & Stamping Company. The principle of the yieldable arch and how it works, plus photographs, sketches, and engineering details are given. Circle No. 38.

**FILTER MEDIA:** Engineered fabrics and custom designed dust bags for solving any problem in industrial dust collection is the subject of Bulletin 14 released by The National Filter Media Corporation. Circle No. 39.

**EXHAUSTERS** manufactured by Rees Blow Pipe are detailed in Bulletin No. 39. These high efficiency, steel plate exhaust fans give economical service in both underground and surface installations. Circle No. 40.

**VALVES AND FITTINGS** that are easy to install and maintain, and offer low cost corrosion resistance are the subject of the new 16-page Walworth Company bulletin. Circle No. 41.

**CRAWLER TRACTOR** applications for the new Allis-Chalmers H-3 and HD-3 compact units are pictorially described in a new catalog now available from the company. Circle No. 42.

**UNIT (BIN) VIBRATORS** being offered by Eriez Manufacturing Company to handlers of all types of bulk materials are described in their latest illustrated 6-page brochure. Circle No. 43.

**ENGINEER'S LEVEL** by Wild Heerbrugg features a telescope which can be rotated about the optical axis together with the level vial assembly for quick checking of level adjustments. Booklet N-2 contains full details. Circle No. 45.

**NEW BELTING** development that uses oriented nylon strip both to strengthen conveyor belting and greatly extend its life has been announced by the Goodall Rubber Company. For details and information circle No. 46.

**MINING LOCOMOTIVES** for trolley, battery, combined and cable reel operation of all types and sizes are manufactured by Allgemeine Elektrizitäts-Gesellschaft of West Germany. For details and information on these dependable units circle No. 47.

**AUTOMATIC FAN DRIVE** has been introduced by International Harvester that operates your truck engine fan only when you need it reportedly saving up to 10 percent on fuel costs and freeing as much as 12 percent of usable horsepower. Circle No. 48.

**FLEXIBLE TUBING** is the subject of a new brochure, "The Facts About Flex-flyte," now available from Flexible Tubing Corporation. The brochure describes the construction and uses of Flexflyte tubing for ventilation, fume removal and materials handling systems. Circle No. 49.

**FRONT END LOADER:** Design features of the Caterpillar 992 Series A Traxcavator which make it a top producer in materials handling work are detailed in a 12-page booklet just released by Caterpillar Tractor Company. Circle No. 50.

**POWER PULLEYS** that contain the driving parts for a belt conveyor inside the driving pulley are manufactured by J. D. Christian Engineers of San Francisco. Their new Bulletin PPT-59 describes the advantages and economies to be gained by using these revolutionary, new-type pulleys. Circle No. 53.

**RUBBER** products for industry manufactured by Raybestos-Manhattan, Inc. are detailed in a new 24-page, condensed general catalog just issued by the company. Conveyor, transmission and V-belts are included as well as all types of hose, rubber pipe, and other rubber products. Circle No. 54.

**REVERSE ALARM** for heavy mechanical equipment is being made by E. D. Bullard Company. The Bull/Horn is a dependable, mechanical back-up signal easy to operate and install, and requires no maintenance. Circle No. 55.

**GASOLINE ENGINES** from 2½ to 9.6 horsepower manufactured by Clinton Engines Corporation supply dependable power for auxiliary pumps, small lighting plants, and other applications around mines, mills, and industrial plants. For information on these quick-starting engines circle No. 56.

**TRUCKS** for heavy-duty ore transport over poor roads are a specialty of Volvo AB of Sweden. The versatile Diesel-driven four-wheel drive cross-country truck model L38545 is described in an 8-page bulletin. Circle No. 57.

**STEEL SCREENS:** The use of welded stainless steel screens to solve production problems in mining and ore preparation plants is covered in a new 28-page brochure published by Bixby-Zimmer Engineering Company. Circle No. 58.

**MINING EQUIPMENT:** An illustrated 76-page booklet describes the complete line of mining equipment manufactured by Huwood Mining Machinery Ltd. of England, including belt conveyors, scrapers, roof supports, electrical apparatus, underground locomotives, drilling, and protective items. Circle No. 61.

FEBRUARY 1961

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61	62	63	64	65	66	67	68	69	70
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"CUSTOM ALLOY Steel Castings" is the title of the new catalog just released by ESCO Corporation which contains technical data regarding heat, corrosion, and abrasion resistant alloy steels. Circle No. 62.

TRACTOR-SCRAPER team that is a top producer is the Caterpillar 619B-442. The engineering and design details are discussed in a new 12-page booklet just issued by the Caterpillar Tractor Company. Circle No. 63.

MAGNETOMETERS: A new look at Varian's magnetometer family is provided in a leaflet just issued by Varian Associates of Palo Alto, California. Circle No. 64.

CONVEYOR SCALE which automatically weighs, measures, meters and/or controls the flow of bulk materials on conveyor belts has recently been introduced by Ramsey Engineering Company. For information circle No. 65.

SHAFT MOUNTED DRIVES and flange mounted drives manufactured by The Falk Corporation are detailed in the 36-page Bulletin 7100. Design and construction advantages are included as well as selection and dimensional data. Circle No. 66.

MAGNETIC DRUM SEPARATORS offered by Stearns Magnetic Products are described in a new color brochure Bulletin 2013. Complete specification and dimensions are given on all sizes of wet permanent magnetic drum separators offered by the company. Circle No. 67.

BLAST HOLE BITS: A 12-page Mining and Quarrying Catalog, featuring specifications and engineering data for "Super-Aire" heavy-duty blast hole bits, has been published by Security Engineering. Circle No. 68.

STEEL ROOF SUPPORTS for all types of underground installations are detailed in an 11-page catalog issued by Skinningrove Iron Company Ltd. Specifications and engineering data on all types of arches and props made by the company are included. Circle No. 69.

THE RESEARCH FOUNDATION of the Colorado School of Mines is engaged in almost all types of research for the mining industry. A new 32-page illustrated brochure describes the facilities and activities of this famous organization. Circle No. 70.

AIR SEPARATORS: Bulletin No. 087 describes Sturtevant separators which classify sand without water. The text points out that pre-classification by air can increase screening production by removing screen blinding fibers. Circle No. 71.

FEEDERS of all sizes and types for your specific requirements are available from Hardinge Company. For the Hardinge Feeder Story, with drawings, photos and detailed specifications circle No. 72.

SPIRAL CLASSIFIERS that have a proven performance record for over 50 years are the Akins models used on closed-circuit grinding, washing, desliming, dewatering, and size separation. Catalog 601 by Mine & Smelter Supply Company gives complete information. Circle No. 73.

ROCK BITS that bite in and chew out rock to give that extra margin of output are the Hole-Master bits made by Brunner & Lay. The complete story on these cost-saving drilling tools is given in Bulletin #559-13. Circle No. 74.

DIAMOND CORE DRILL that is lightweight and lean, ready to prospect anywhere, is the Hillbilly drill made by

Acker Drill Company. Complete specifications and information are given in Bulletin 29MW. Circle No. 75.

MAGNETORQUE, the electro-magnetic drive that makes P & H electric shovels profitable producers in large-scale digging, is described in a new illustrated brochure just issued by the Harnischfeger Corporation. Circle No. 59.

DUST COLLECTION: A new line of automatic dust collectors, whose modular design and self-cleaning action suit them to unlimited applications, has been introduced by Torit Manufacturing Company. Circle No. 60.

FLEXIBLE HOSE made by The Flex-aust Company is the subject of Bulletin No. 605 just released by the company. The 12-page booklet gives selection and installation information as well as prices. Circle No. 52.

FLAT-BELT PULLEY bulletin by T. B. Wood's Sons Company covers a complete line of "Sure-Grip" flat-belt pulleys in face widths from 2½ to 12 inches and OD from 4 to 36 inches. Circle No. 51.

SPEED BELTS: A new line of variable speed belts in a wide range of sizes and types for all industrial applications has been announced by Lovejoy Flexible Coupling Company. Circle No. 44.

JAW CRUSHER: Bulletin 132-60A recently released by Universal Engineering Corporation, covers the salient features of their big 4848 overhead eccentric jaw crusher with a top rated capacity of up to 950 tph set at 12 inches. Circle No. 88.

TIMING-BELT DRIVES for mechanical power transmission are available for load capacities from fractional horsepower up to 600 hp, and for all belt speeds up to 16,000 fpm from T. B. Wood's Sons Company. Details are given in the new 80-page catalog No. 19103. Circle No. 89.

DIESEL ENGINES, Models 10000 and 11000 recently introduced by Allis-Chalmers are described in the new two-color, 8-page catalog just issued. Circle No. 91.

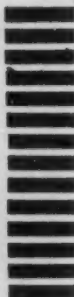
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Suggestion: First chance you get, order a set of Amsco End Bits from the nearest Amsco Dealer. If you don't know who he is, write us, and we'll send you his address plus a copy of the Amsco End Bit Buyer's Guide.

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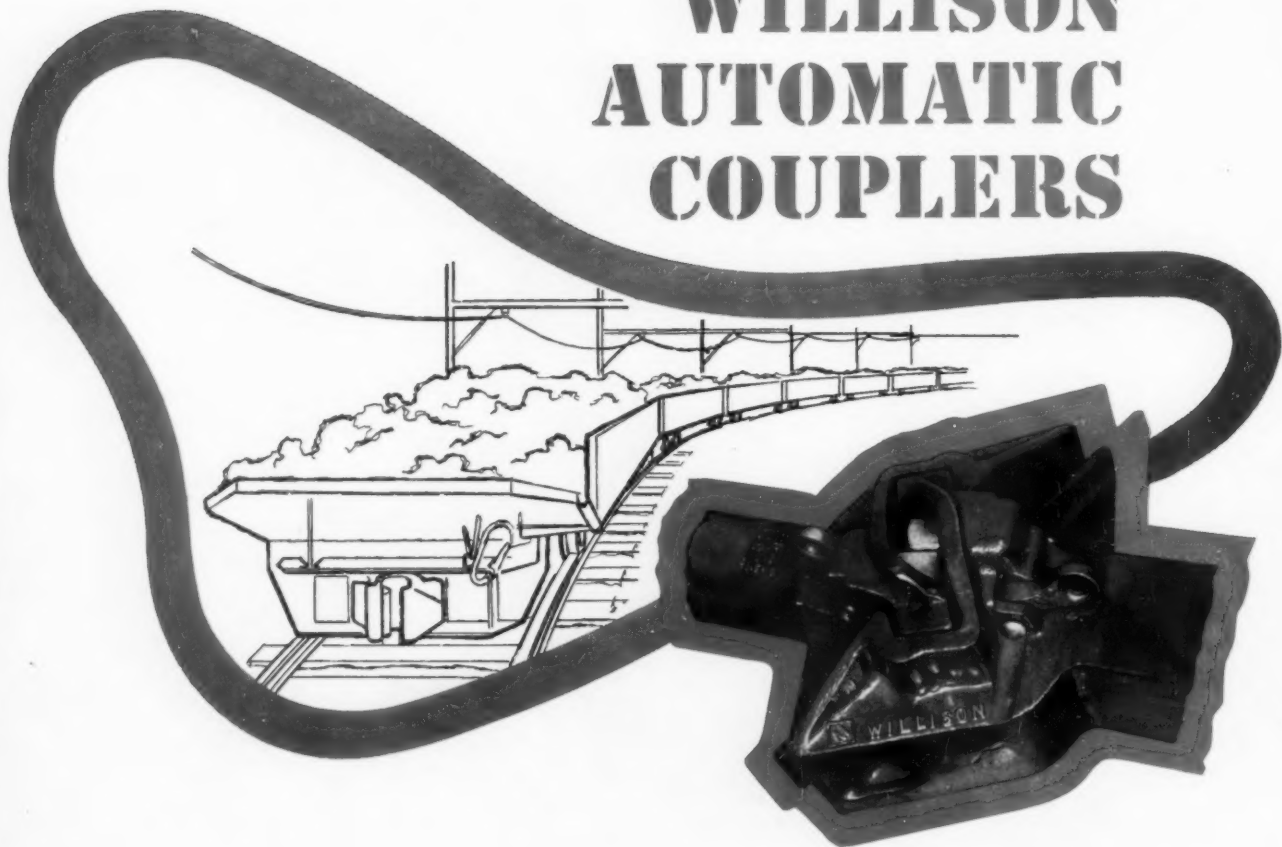


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# NEWSMAKERS in world mining



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J. C. GRAY



J. K. GUSTAFSON



G. HUH



S. E. JEROME



A. M. WILSON

**Weston Bourret**, mining geologist, has been elected vice president of Utah Construction and Mining Company of San Francisco, California. He will also continue in his present position as manager of the mineral development and geology department. Mr. Bourret, who came to Utah in 1952, was formerly associated with Kennecott Copper Corporation as a mining geologist and also with Phelps Dodge Corporation.

**James C. Gray**, administrative vice president, raw materials, of the U. S. Steel Corp., has been elected president of the Society of Mining Engineers. He will succeed **Dr. Arthur B. Cummins**, February 28, during the annual meeting of the AIME in St. Louis, Missouri.

**Joseph M. Mavincel**, formerly associated with the El Salvador project of the Andes Copper Mining Company, Potrerillos, Chile, has returned to the United States.

**Charles A. McKinley**, former general manager of the Sidney Mining Company, Kellogg, Idaho, has joined Trout Mining Company's silver, lead, zinc, and manganese dioxide mining and milling operations at Philipsburg, Montana as general manager.

**C. Arthur Zeldin**, superintendent of refinery operations of Utah Copper Division of Kennecott Copper Corp., has been named superintendent of refinery operations at Utah Copper. Others reappointed in personnel shifts in the company are **Dean D. Kerr**, new superintendent of operations at the Bingham open pit, and **John C. Larson**, new superintendent of refinery operations at the Garfield headquarters.

**Ignacio Hinojos** has been appointed technical representative of the mining chemicals department of Cyanamid de Mexico, S. A. de C. V. His headquarters will be in Torreon, Coahuila, Mexico. Mr. Hinojos has been associated with the Fresnillo Company of Mexico, the Minas de Iguala and Cia. Minera Noche Buena y Anexas.

**C. V. Isbell**, former president, and **John W. Isbell**, former vice-president of Isbell Construction Company, have formed a new corporation, C. V. Isbell Properties Co., Inc., in Reno, Nevada.

**Dr. John K. Gustafson**, former vice president of Hanna Mining Company, Cleveland, Ohio, has succeeded **Dr. D. H. McLaughlin** as president of Homestake Mining Company of San Francisco, California. Dr. McLaughlin has assumed the position of chairman of the board.

**Ginn Huh**, mining engineer for the Korea Tungsten Mining Company's SangDong schelite mine in the Republic of Korea, is making an extensive world tour. He is spending several months in the United States before returning to Korea by way of Europe. He is particularly interested in sand filling and ventilation methods which can be adopted at SangDong, the world's greatest tungsten-bismuth mine.

**S. K. Droubay**, vice president and general manager of the United Park City Mines Company of Park City, Utah, has been elected 1961 president of the Utah Mining Association. Other new officers are **F. C. Green**, assistant to the general manager, western mining divisions, Kennecott Copper Corp. of Salt Lake City, first vice president; **Mitchell Melich**, president of the Uranium Reduction Company of Moab, Utah, second vice president; and **J. P. O'Keefe**, general manager, Utah copper division of Kennecott Copper Corp., third vice president.

**Dr. Frank H. Spedding**, director of the Institute for Atomic Research at Iowa State College and the Ames Laboratory of the Atomic Energy Commission, will be awarded the AIME's James Douglas Gold Medal during its annual convention in St. Louis, Missouri.

**Albert Hopkins** of Hopkins Mining Consultants, Ltd., Toronto, Ontario, Canada, has been investigating, surveying, and mapping trap rock deposits on islands in the north channel of Lake Huron, Ontario for Poly Ores Mining Company, Ltd. and Tough-Rock Quarries, Ltd.

**Thomas A. Stewart**, former mine superintendent for the Compania Minera Castano Viejo in the Province of San Juan, Argentina, has recently returned to the United States with his wife and family. He will live in Berkeley, California, until reassignment abroad.

**Dr. Stanley E. Jerome**, former consulting geologist for Hunting Geophysical Services, Inc. of Salt Lake City, Utah, has been appointed associate director of the Nevada Bureau of Mines and the Nevada Mining Analytical Laboratory.

**A. M. Wilson**, metallurgical engineer, has been elected vice president of Utah Construction and Mining Company of San Francisco, California. Mr. Wilson, who joined Utah in 1954 as manager of the company's uranium operations, is currently manager of mining operations. Prior to his connection with Utah, he was employed by Bradley Mining Company in Stibnite, Idaho, and Molybdenum Corporation of America at Mountain Pass, California.

**Paul Bailly** has been appointed president of the Bear Creek Mining Company, Salt Lake City, Utah, a domestic subsidiary of Kennecott Copper Corporation. He joined Kennecott in 1952 and has been district geologist for the central district of Bear Creek in Minneapolis, Minnesota, since 1957.

**Frank W. Archibald** has been named vice president and general manager of Southern Peru Copper Corp., succeeding the late **Kuno Doerr, Jr.** Mr. Archibald, who came to Peru as smelter superintendent at Ilo, will make his headquarters at the corporation's Toquepala mine.

**Sir G. S. Harvie-Watt** has succeeded **R. Annan** as chairman of the board of the Consolidated Gold Fields of South Africa, Ltd. Mr. Annan, who has been with the firm for 30 years, has been appointed president. Others named in personnel changes within the company are **G. G. Potier**, deputy-chairman; **W. J. Busschau**, chairman of South African administrative and technical services; **L. F. Campbell Pitt**, an executive director of gold fields of South Africa, and **F. G. Zeppenfeld**, group consultant.

**H. Sommerfeldt Jacobsen**, president and managing director of Atlas Copco Canada, Ltd., has been appointed director of Swedish Diamond Drilling Co. at Stockholm, an affiliate of the world-wide Atlas Copco group. He had been president and managing director in Canada for the past five years.

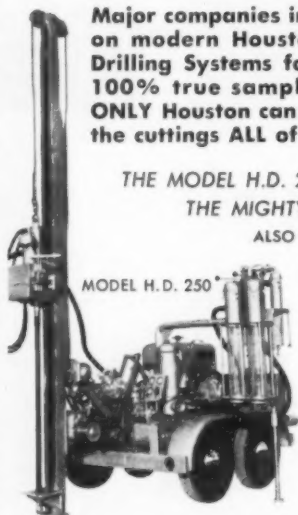
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# INTERNATIONAL NEWS

## Mitsubishi Firm To Build 50,000-Ton Aluminum Plant

A new supplier for Japan's ever increasing demands for aluminum will be Mitsubishi Chemical Company, which plans to start production at its new 50,000-ton-per-year plant in less than two years.

Present producers in Japan are Nippon Light Metals Company, the Showa Denko Company, and Sumitomo Chemical Company, with a combined output of about 140,000 short tons of aluminum annually. This output, though an increase, is still short about 30,000 tons of the country's requirements.

The Mitsubishi plant will be built in Naoyetsu, northern Japan, where port facilities will be improved to permit use of 10,000-ton class ore carriers.

Bauxite will come from Australia from mines controlled by Western Mining Corporation.

First phase of the project, which will cost about \$33,500,000, will provide facilities for producing about 25,000 tons of aluminum per year. This is scheduled for completion by September, 1962, while the second stage is due to be ready two years later. Power will come from natural gas supplied by the Teikoku Petroleum Company, while Pechiney of France will provide production techniques for the new plant.

## Asia

**THAILAND**—The tin dredging operation of **Kamunting Tin Dredging Ltd.** is expected to continue for about 11 years with two dredges in service.

**IRAN**—Mining properties of the **Khomein Mining Company** which have been closed for the last year because of low lead prices are reportedly for sale. Iranian firms and those from other countries are investigating purchase possibilities but no definite action has been taken. The Khomein firm was organized in 1956 to develop lead and zinc deposits in Khomein and Gulpaygan. The French concern, Penarroya, holds a 49 percent interest in the company.

**JAPAN**—**Nippon Seiko Mining Company** has located a gold-bearing vein three to four feet in width. Samples average 5.1 grains gold, and 30 to 35 grains silver per metric ton, but reserves have not yet been confirmed.

**INDIA**—First shipment of iron ore from the **Sunkadakatte** mines was due to be shipped in December from the port of Mangalore. The deposit is located in a five-mile bed near the pilgrim center of Subrahmanya in South Kanara district. Reserves, which reportedly average 56 to 58 percent Fe, are estimated at 3,000,000 to 5,000,000 tons. Government geologists are presently investigating a 25-mile square area in the region with the expectation of locating additional deposits. Mining at Sunkadakatte began in November with plans for mining at least 25,000 by next May.

**GOA**—Iron ore production and exports continue their steady increase, with a new high expected when 1960's fig-

ures are totalled. Exports for the six months of the year totalled 2,810,409 tons, compared with 1959's total yearly exports of 3,940, 210. Production last year was 4,009,035 tons, nearly seven times that of 1952, when 597,095 tons were produced and 602,063 tons exported. Mining operations are not technically advanced and only a few mines are mechanized. Ore is exported as mined, since there are no mills for beneficiation.

**MALAYA**—Export of tin metal from the Federation of Malaya and Singapore for the first three quarters of 1960 totalled 54,248 long tons, while imports of tin concentrate for smelting in that period amounted to 2,623 long tons, with estimated metal content of 1,879 long tons. Imports came mainly from Burma, Laos, Indonesia, and Thailand. Production of tin-in-concentrate from mines in the Federation for the period was 38,095 long tons.

**JAPAN**—Continued exploration during the last year has increased reserves at the new copper discovery of **Dowa Mining Company Ltd.** from 4,800,000 metric tons to 6,700,000 metric tons. Further drilling in the area is expected to increase reserves to 7,000,000 metric tons of ore assaying 2.9 percent Cu. The ore body, called the Uchinotai, is near Dowa's **Kosaka** copper operations in Akita Prefecture, Japan.

**MALAYA**—The long-life potential of **Malayan Tin Dredging Ltd.** is emphasized by a recent reassessment of the company's mining land reserves. At **Kampong Gajah**, where a new £1,000,000 dredge was put in operation in 1959, there are about 370,000,000 cubic yards, enough to keep Nos. 2A, 3A and 4A dredges at work for at least 35 years. The relatively small Nos. 5 and 6 dredges each have about one year's life left on the remaining 4,500,000 cubic yards available at **Batu Gajah**. The company is considering the installation of a fourth deep-digging dredge at **Kampong Gajah** if the unit will be able to obtain a permitted production assessment should tin export control be put in force again.

**IRAN**—The **Steel Corporation of Iran** has contracted with **Kaiser Engineers and Constructors, Inc.** of Oakland, California, to assist in the planning and completion of the corporation's proposed steel plant facilities. The contract includes an analysis and report covering all phases of the project including raw materials, location, market, products and processes, preliminary design, construction and operating costs, as well as financial requirements. Iran's industrial growth since World War II makes development of a steel industry of great importance since it now imports all of its steel.

**CYPRUS**—The mine and plant of the **Esperanza Copper and Sulphur Company Ltd.** are now equipped to handle a throughput of some 25,000 tons of copper ore per month to produce some 1,000 tons of concentrate monthly. Exploratory drilling on the **Limni** concession has been confined to an area north-east of the open pit mine. Exploration continues and to date some 400,000 tons of ore, averaging 1.13 percent Cu, have been disclosed. The company retains

prospecting licenses over about 20 square miles outside of and adjacent to the **Limni** concession.

**INDIA**—A second ferro-manganese plant is scheduled to be built at **Dandeli** in Mysore State, with an annual production capacity of 44,000 tons. Output at the present plant is 10,000 tons per year.

## Europe

**WEST GERMANY**—The Fourth International American Air Filter Conference in Dortmund sponsored by **CEAG (Concordia Elektrizitats-Aktiengesellschaft)** was attended by delegates from Norway, Sweden, Denmark, The Netherlands, Great Britain, France, Switzerland, Finland, Belgium, Spain, Italy, the United States, Canada and South Africa. During the two-day meeting manufacturers studied new air-filtering and dust-catching equipment and methods, and discussed results of recent research programs.

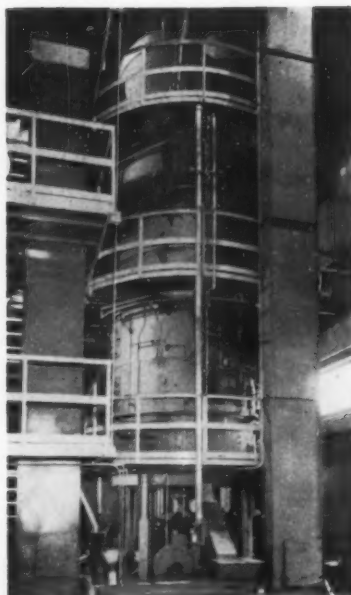
**ITALY**—A rather extensive bauxite deposit was discovered recently by the **Monte Amiata Company** in the Nurra area of northern Sardinia. The bauxite is interbedded within reef limestones of Cretaceous age, as is most bauxite in the Mediterranean area. Since the ore is a few meters thick, some should be mined by underground methods. The  $Al_2O_3$  assays are reportedly good, although the silica content is high. Further drilling is under way.

**SPAIN**—Rights to prospect for ilmenite, iron, bentonite, and clay in the mining zones of Salamanca and Almeria have been granted recently.

**NORWAY**—Estimates of ferrosilicon exports from Norway indicate a new record of 150,000 tons was set in 1960. Total capacity of all Norwegian ferrosilicon plants is now 180,000 tons a year, compared with 40,000 tons before World War II.

**FRANCE**—Initiator of the recent export sulphur price increase was **La Societe Nationale des Petros d'Aquitaine**, which extracts sulphur from rich natural gas reserves near **Laq** in southwestern France. According to some estimates, of the 2,600,000 tons of sulphur sold internationally, the French firm accounted for almost 700,000 tons in 1960, nearly double its sales in 1959.

**YUGOSLAVIA**—A program that will bring almost complete automation to mining and transportation of magnesite is scheduled at the **Goles** mines which are located in the territory of Kosovo and Metohija called **Kosmet** about 30 miles south of the **Trepca** mines. The project will also increase production from the present 55,000 tons to 75,000 tons a year. A new separation plant equipped to improve grade and increase the variety of production will be built. A later phase of the program includes addition of a plant to produce sintered magnesite. Cost of the first phase of the expansion program will be 613,000,000 dinars (\$1,000,000). **Metalurgija-Projekt** of Belgrade, a major Yugoslavian design concern, is in charge of the program.



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## WHAT'S GOING ON . . . INTERNATIONAL

**SPAIN**—In recent months six uranium deposits that can be mined profitably have been discovered in the Zamore region.

**EIRE**—Vespar Mines Ltd. of Canada is drilling on its 16-square mile copper concession in Waterford County on the south coast of Eire. A contract for 5,000 feet of drilling has been signed with Boyles (England) Diamond Drilling Company after geological mapping picked up several new copper veins and geophysical surveys indicated five major anomalies. Activity is centered near the town of Bunmahon in an area that was an important copper producer before 1890 when mining ceased because pumping facilities then available were inadequate for operations below 1,000 feet. Previous operators located several copper-bearing structures, and widths of from 10 to 60 feet were mined. Grade averaged from 2½ to 3 percent copper. Vespar, which acquired the concession early last year, is the former Cody-Reco Mines and is controlled by Denison Mines Ltd., which is engaged in world-wide exploration activities.

**UNITED KINGDOM**—Alcan Enfield Alloys will lease the aluminum alloy smelter and zinc alloy production facilities owned by John Dale, a member of the Metal Closures group, which will provide Alcan with the capacity to produce some 30,000 tons of aluminum alloys a year. John Dale's light alloy foundry and continuous strip casting plant at London Colney will not be affected by the Alcan arrangement. Alcan Enfield, formed earlier this year by Aluminium Ltd. of Canada and Enfield Rolling Mills, already operates a secondary aluminum smelter at Bradford. Alcan Industries, the United Kingdom subsidiary of Aluminium Ltd. of Canada, accounts for about 30 percent of this country's fabricated aluminum output. Its rival North American producers all now have a substantial stake in the market here. After Reynolds Metals, together with Tube Investments, acquired control of British Aluminium, Aluminum Company of America, the largest producer, teamed up with Imperial Chemical Industries to form Impalco, and Kaiser Aluminum acquired a 50 percent interest in James Booth Aluminium.

**NORWAY**—According to the Minister of Industry, Kjell Holler, Norway should be able to quadruple its output of aluminum during the next decade, increasing from the current level of about 200,000 tons annually to nearly 800,000 tons. This increase would require investments totalling \$800,000,000 to \$1,000,000,000. At a recent symposium of businessmen and economists in Oslo, Trygve Lie said that several foreign firms have indicated interest in starting aluminum production here because of the country's abundant resources of cheap hydroelectric power.

**SPAIN**—A new company has been formed by the Banco Central and the Lipperheide-Unquiesna group for development of pyrite deposits with considerable zinc and lead content located near Aznelcollar, province of Seville. The firm is headed by D. Ignacio Villalonga, also chairman of the newly formed Andaluza de Pyritas.

## Oceania

**NEW ZEALAND**—The aluminum smelter to be built by the **Consolidated Zinc-Kaiser Aluminum** partnership will be constructed on reclaimed land at Bluff Harbor and the industry's expected labor force of 6,000 will double the population of the Bluff-Invercargill area. The agreement provides that, within the next 10 years, the partnership must construct a power station capable of producing at least 100,000 kilowatts for 24 hours a day, which is equal to the combined peak load output of the two largest North Island hydroelectric stations. Within 20 years output must be raised to the full potential of over 600,000 kilowatts continuously. All fixed assets, including tunnels, dams and power houses, will revert to the state at the termination of the agreement, with no capital expenditure required. Other phases of the aluminum project include development of bauxite mining reserves in the Weipa area on Cape York Peninsula, Australia; construction of a 360,000 long ton alumina refinery at Weipa; expansion of the Bell Bay, Tasmania aluminum reduction works from 12,000 to at least 28,000 long tons; and establishment of fabricating facilities. The smelter at Bluff will have a capacity up to 120,000 long tons of primary aluminum per year. The hydroelectric power station will use waters of lakes Te Anau and Manapouri.

**AUSTRALIA**—Although final figures have not been released, Australian copper production for 1960 appears to have set a record, with a total of 115,000 tons mined, compared to the previous year's record of 95,000 tons. A further increase for 1961 is expected, with eventual growth to between 160,000 and 180,000 tons during this decade.

**REPUBLIC OF THE PHILIPPINES**—An emergency assistance plan approved in December by the Central Bank provides that the Bank is to buy newly mined gold at the free market rate of exchange. Gold producers are to retain 90 percent of the dollar proceeds of their sales and will be allowed to bring in all imported supplies at the preferred rate of two pesos per dollar. The assistance plan was necessary because of the government's monetary decontrol program. Despite the assistance, Philippine gold producers still contend that many firms cannot survive and several mines will have to cease operations permanently. Reopening these mines would be difficult because of the huge financing required.

**NEW GUINEA**—During the current fiscal year to December 4, 1960, **Bulolo Gold Dredging Ltd.** dredged and sluiced 2,868,565 cubic yards of gravel for a total recovery of 9,760 ounces of fine gold, for a value of \$341,600, which is \$73,000 lower than for the same period the previous year.

**AUSTRALIA**—The Federal government has decided to permit controlled and limited exports of iron ore, relaxing an embargo in force since 1938. The official estimate of iron ore reserves has increased from 259,000,000 tons in 1940 to 368,000,000 tons in 1959, despite the mining of some 50,000,000 tons in that period. Export is prohibited from the Middleback Ranges (South Australia) Koolan, Cockatoo and Irvine Islands (Yampi Sound, Western Australia) and

the Koolyanobbing-Dowd's Hill-Bungalbin area (Western Australia). Export of up to 5 percent of other deposits is permitted at a general rate of not more than 1,000,000 tons a year from each. The legislation contains other special provisions, such as that referring to special consideration for exporting low-grade and refractory ore and low-grade concentrates.

**VICTORIA**—**Morning Star Mines** N. L. of Wood's Point is proceeding with its difficult shaft-sinking operation and anticipates a completely new geological appraisal of the area. The dike basin in which auriferous reefs have been worked is 300 feet wide by 1,600 feet long, but extensive zones, especially in the northern part of the dike, have never been examined.

**NORTHERN TERRITORY**—The ore body of **Peko Mines**, N. L. at **Tennant Creek** seems to be smaller below about 1,100 feet. Diamond drilling in the footwall zone at the 130' level has disclosed two small ore bodies, but on the whole both reserves and grade are decreasing. At the Orlando area west of Tennant Creek, the company has undertaken more development work than was originally planned, but no proper assessment has been possible yet due to small and irregular distribution of gold. Occurrences located so far are in the footwall zone of a leached, oxidized zone of a possible pyritic copper occurrence. Some pods of native copper have been encountered and it is possible the deposit will prove similar to the Peko ore body itself, with sulphide copper ore at levels below those drilled thus far.



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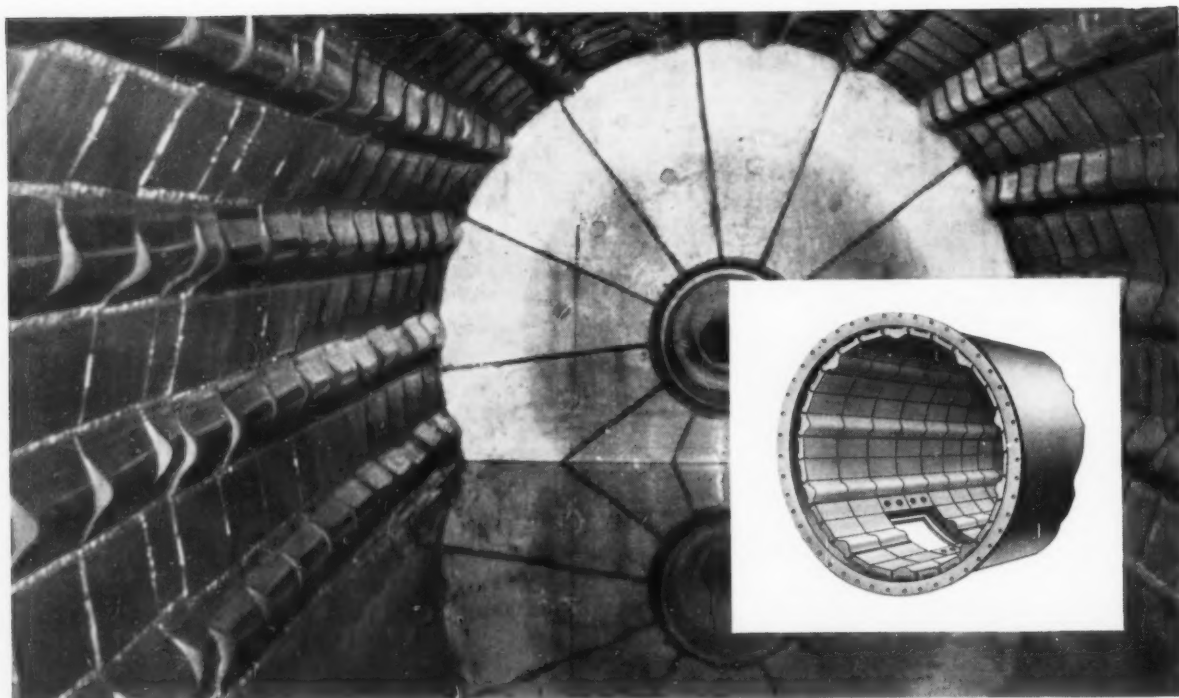
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## Africa

### Swedish-American Iron Ore Project in Liberia Begins

First shipments of ore from the Mount Nimba deposits in Liberia are expected to begin in mid-1963, with annual output of 6,000,000 tons during the first few years. Construction of a harbor and railway facilities from the mine to the seacoast has already been started under contract with Raymond International of New York.

The Export-Import Bank recently granted a \$30,000,000 credit for the Liberian-American-Swedish Minerals Company (Lamco) to assist in developing the deposits, located north and east of Liberia's capital, Monrovia. The bank credit will be used to assist in financing the \$200,000,000 project and will be spent entirely for purchase of United States goods and services.

The Nimba development will be a joint venture in which Lamco has a three-fourths interest, and Bethlehem Steel Corporation of the United States, a fourth interest. Half the stock of Lamco is owned by the Liberian Government and the other half mainly by a Swedish syndicate and the International African American Corporation of Delaware. Liberian citizens will be offered an opportunity to purchase an equity interest in Lamco.

Located about four years ago, the Nimba deposit has reserves of 200,000,000 tons of iron ore with an average grade of 65.5 percent Fe. Eventual output is expected to reach 10,000,000 tons annually. Bethlehem will take one-fourth of the ore mined and additional amounts under certain conditions. The port facilities are being built at Buchanan and connected by a 165-mile railway with the mine.

**UNION OF SOUTH AFRICA**—Possible purchaser of **Kennecott Copper Corporation's** substantial holdings in two South African gold mining companies is the **Engelhard** group, headed by C. W. Engelhard, who is also chairman of **Rand American Investments Pty. Ltd.** Engelhard Industries is a major United States refiner and fabricator of the platinum group of metals, with several subsidiary companies in related fields. Rand American, whose portfolio includes South African gold stocks, is joining with **The British South Africa Company, De Beers Consolidated Mines Ltd., Anglo American Corporation of South Africa Ltd. and Johannesburg Consolidated Investment Company Ltd.** in a transaction that will increase assets of **Rand Selection Corporation Ltd.** to over £100,000,000 and widen its scope for greater participation in South African mining and industrial development. Firms associated with Rand American include Engelhard Industries, **International Nickel Company of Canada, Central Mining and Investment Corporation Ltd., and Union Corporation Ltd.** Kennecott is understood to be negotiating to dispose of its investment of some \$47,000,000 in **Virginia Orange Free State and Merriespruit O.F.S.** gold mining firms. (Editor's note: This sale was confirmed by Kennecott January 13. The above report of negotiations reached us when type for this issue was being set. For complete story see **MINING WORLD, March.**)

**MOZAMBIQUE**—Production of concentrated beryl in Mozambique, the world's third largest producer, could al-

most be doubled if a new flotation process replaced present hand sorting. This was pointed out by Dr. Norman Williams, chief geologist of **Beryllium Resources, Inc.**, after he and Bruce Odum, president of the Los Angeles, California firm, made an ore survey trip to this country, the Congo Republic, South Africa and other areas where beryl is produced. Negotiations involving the Van Dornick flotation process controlled by the United States firm are presently under way in several foreign countries. Beryllium Resources will use the process at its new Utah plant.

**CONGO REPUBLIC**—Officers of the United Nations Ghana brigade stationed in Kasai province reportedly have offered to provide adequate protection for diamond mining operations to be resumed in the province. Provincial authorities in Luluabourg support this action and are anxious that mining should start again. Congolese employees are gradually returning to their jobs, many of them lured by the prospect of food. Most of the European technicians, too, have returned. A production goal of 12,000,000 carats has been set for 1961, but some see this as too optimistic a figure for the uncertain political status of the republic.

**FEDERATION OF RHODESIA & NYASLAND**—Expansion of the mining industry in the copper belt during this decade is expected to bring yearly output up to 690,000 long tons, about three times the yearly production of 1948.

**UNION OF SOUTH AFRICA**—**Zaai-plaats Tin Mining Company Ltd.** has confirmed that the previously unknown ore body located last fall is extensive in both size and grade. The ore body was intersected during an exploratory drive west of present workings. An additional lode has now been located in this area, while drilling to the north disclosed two other lodes. Exploration has been suspended for a time while a ventilation raise is driven back into the old workings. When this raise is holed through at about 1,000 feet, exploration westward will be continued.

**SOUTH WEST AFRICA**—The rail track between Usakos and Tsumeb has been broadened to the same 42-inch gauge as that used in the Union of South Africa, permitting use of Diesel electric traction units. The improvement was part of a £6,300,000 project for railroads serving the main mining areas. The new track will permit faster and better transportation to market for the products of **Tsumeb Corporation Ltd.**, which is currently constructing a copper smelter, and a lead smelter and refinery at Tsumeb.

**SIERRA LEONE**—An agreement signed recently by the government and **The Diamond Corporation, Sierra Leone, Ltd.** provides for prospecting for both gold and diamonds and is expected to result in more data regarding future development of the territory's mineral resources.

**ALGIERS**—An iron and steel plant with an initial capacity of 500,000 tons per year will be built near Bone on the Algerian coast by a new company, **Societe Bonoise de Siderurgie.** Construction is to start in October and be finished in 1962. The project will cost about 820,000,000 French francs and the company will be capitalized at 17,100,000 francs initially. A group of French iron manufacturing companies will own 51 percent of the

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INTERNATIONAL

shares, and 2 percent will be owned by Societe de l'Ouenza, main supplier of iron ore for the plant. The remaining portion will be owned by French banks and development companies. President of the new firm is M. Henri Vicaire, formerly director general of Schneider-Creusot.

**GHANA**—The mining industry here is making strenuous efforts to combat the crippling effect of recent Government-decreed wage increases at marginal gold mines. Conferences with the Ghana government and the Chamber of Mines on the subject have been held by C. J. Burns, head of the Western Selection Group which controls several Ghana gold mines. The two mines most affected by the increase are those of Amalgamated Basket Areas Ltd. in the Western Selection Group, and Bibiani (1927) Ltd., sister company of Ashanti Goldfields Corporation. Since these two firms employ over 8,000 men (almost a fourth of the total gold-mining labor force), the closing of their operations would be undesirable on the grounds of both employment and foreign exchange. Both firms are now operating at a deficit because of the extra wage costs. It is believed that the government will be asked to meet the entire wage increase costs at the two mines, estimated at £172,000 per year.

**GABON**—As an initial step in development of the Mounana uranium deposit, the Compagnie des Mines d'Uranium de Franceville plans to build a mill for producing a concentrate assaying about 20 percent uranium—which will later be sent to France to be refined. The ore will first be crushed to 15-millimeter size, then ground to 350 micro-millimeters. Pulp will be thickened and then given a 10-hour sulphuric acid leach. The resulting uranium-bearing solution will then be precipitated to obtain the 20 percent concentrate.

**MOROCCO**—Some amounts of cobalt ore from the Bou Azzer mines have been shipped to Red China during the last year, despite the designation of the ore as a strategic material under the United States Battle Act. Morocco, which receives substantial economic aid from the United States, normally exports its total output of some 12,000 tons of cobalt per year to France and Belgium. The Societe Miniere de Bou Azzer et du Graara, a French firm, operates the Moroccan cobalt mines, which produce ore averaging 11 percent metal content.

**FEDERATION OF RHODESIA & NYASALAND**—The King Edward mine near Lusaka may be reopened by Nchanga Consolidated Copper Mines Ltd. to provide additional pyrite required for flux at its Nkana smelter.

**UNION OF SOUTH AFRICA**—O'okiep Copper Company has obtained options on farms adjacent to its copper mining operations in Namaqualand. Smelter production is expected to remain at the current level of about 40,000 short tons a year. Higher production costs and the recent drop in copper prices are expected to lower O'okiep's dividend rate this year. The company has announced its plans to prospect for diamonds in South Africa.



## Canada

CANADA—Three major United States mining companies are among the scores of Canadian firms that are stepping up mineral exploration throughout Canada this year. Prospecting for gold, silver, and nickel will receive great emphasis, but the search for the three prime base metals—copper, zinc and lead—will be intensified also. **Anaconda Company (Canada) Ltd.**, subsidiary of the big United States copper producer, will continue its exploration on the same basis as in 1959, with investigations in the Maritimes, Quebec, and northwestern Ontario. **Kennecott Copper Corporation** is expected to continue Canadian activity through **Keneco Explorations**, operating throughout the country. A search for base metals in the Mattagami and Noranda districts, plus general prospecting in British Columbia and the southwest Yukon, will be undertaken by **Southwest Potash Corporation**, subsidiary of **American Metal Climax, Inc.** Continued drilling on a potash prospect near the eastern end of the Saskatchewan potash belt is also planned.

ONTARIO—Production of copper concentrate at the rate of 500 tons a day initially was due to start early this year by **Rio Algom Mines** at its **Pater** property near Elliot Lake. The company also plans a shaft deepening program that will develop the mine 1,200 feet below the present bottom level at 950 feet. The program will provide for eight new levels at 150-foot intervals. As underground development on the property progresses the milling rate will be increased to a

possible 750 tons a day. Rio Algom acquired the Pater property through purchase by **Pronto Uranium Mines** before that firm merged into Rio Algom, and the Pronto uranium mill was converted to handle copper ore from the Pater ore body about two miles distant. Present ore reserves are estimated to be about 1,000,000 tons of about 2.0 percent copper to the 950-foot horizon level.

NOVA SCOTIA—A sizeable lead-silver ore body has been found to underlie the barite ore body at the **Walton**, Nova Scotia, property of **Magnet Cove Barium Corporation** of Houston, Texas. Magnet Cove, Canada's leading barite producer, will construct a 125-ton capacity base metal concentrator, that will produce a bulk concentrate of lead and silver with minor amounts of zinc and copper. Tentative plans call for mining the ore by a filled square set method of stoping. Indications of lead-silver values over 35 to 40-foot widths underlying the barite ore body between 500 and 800-foot depths were indicated by diamond drilling from the surface in 1957. Underground drilling during the last year from the 690-foot level confirmed a minable tonnage of 225,000 above that level, averaging \$32.10 per ton in silver and lead values. An equal tonnage is indicated between the 690 and 850-foot horizons. There is a five-compartment, 977-foot production shaft with levels at 350, 520, 690, 850 and 920 feet on the property which is leased from **Barymin Explorations**.

ONTARIO—**Selco Exploration Company**, a 66.4 percent owned subsidiary of **Selection Trust of London, England**, will undertake one of Canada's most intensive

exploration programs this year. The British firm owns extensive Rhodesian copper and African diamond interests, but because of the political situation in those areas, it is emphasizing its Canadian activity. In addition to an annual exploration budget of \$1,000,000, Selco plans to participate in financing and development of other large-scale gold or base metal projects in Canada. The firm uses its own-design electro-magnetic equipment and a nuclear precession magnetometer for its aerial surveys which covered an average of 10,000 linear miles annually in the last few years. Areas for exploration have been widely scattered between Quebec and Saskatchewan, and range in size from 50 to 200 square miles as a rule. Selco's high-speed exploration methods are often unconventional and much of the geophysical work is done before staking. Many of the surveys are in areas termed unreliably explored or where there was insufficient ground work following an aerial survey. One of the projects scheduled for this year is a large-scale geochemical sampling of lakes in certain parts of the Canadian Shield. Because the Canso plane Selco uses is equipped to take water samples by merely touching down on a lake without landing, the crew is able to sample as many as 100 lakes a day.

ONTARIO—**Denison Mines Ltd.** has been awarded a contract for delivery of 6.5 metric tons of uranium oxide to the **Japan Atomic Fuel Corporation**. A similar order was received in 1959. Estimated Japanese requirements for 1961 call for purchase of 20 metric tons of high-grade uranium concentrate, with increasing quantities scheduled for succeeding years.

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## Latin America

### Japanese Firm May Develop Matilda Mine in Bolivia

Development of the Matilda zinc mine in Bolivia was the subject of recent discussions between Mitsui Mining and Smelting Company of Japan and Corporacion de Bolivia (COMIBOL), operator of the country's nationalized mines.

The Matilda property, formerly owned by the Mauricio Hochschild group, has large reserves of zinc, with lead, silver, copper, antimony and some tin. National Lead Company investigated the area a few years ago, but did not exercise its option, because of low lead and zinc prices at that time. The property near Lake Titicaca is actually a collection of various mining enterprises and accessory plants in the districts of Timusi, Ancoraimas and Carabuco.

Mitsui technical representatives will make a complete study of the project before negotiating a contract with the Bolivian government. If development proceeds, a smelter may possibly be built in Bolivia. In any case, Mitsui will probably not sell ore or slab zinc on the open market, but will ship the product to Japan for its own use. Mitsui is currently engaged in a three-year expansion program, costing 600,000,000 yen, that will increase lead and zinc production at its several operations in Japan.

The Matilda property has also been under consideration by a West German firm whose representative, George Baron, came to La Paz for conferences about the

project. Later, COMIBOL's general manager, Goosen Broersma, went to Bonn, West Germany, for further discussion of the subject.

**ARGENTINA**—The government's *Direccion de Geologia y Minería* is making a detailed study of iron deposits in the Province of Misiones, with particular attention to the **Tacuru** deposit, which has a large tonnage of up to 40 percent FeO. The area containing the deposits has been declared a fiscal reserve by the Misiones provincial government, and private companies are not allowed to explore, study or mine the iron prospects.

**JAMAICA**—**Reynolds Jamaica Mines Ltd.** will continue its present rate of production here despite the deteriorating world aluminum market which has caused **Kaiser Bauxite Company**, the island's largest bauxite producer, to cut back production in the first quarter of 1961 by some 30 percent. About 10 percent of the 950 employes in Kaiser's several Jamaican operations were expected to be affected by the cut-back, which company spokesman indicated was only temporary. Many of the workers were employed on a railway extension project recently completed.

**MEXICO**—Continuing exploration at the gold deposits of San Juan Nepomuceno in Chihuahua has brought encouraging results. Although surface values have diminished with depth, the general outlook is for enough proven ore to warrant building a concentration plant.

**BRAZIL**—**Fosforita Olinda S. A.**, which recently doubled its capital to Cr.

1,000,000,000, will increase production of natural phosphate to 350,000 metric tons per year and build a super-phosphate plant that will consume 150,000 metric tons of the increased output. Last year the company received a \$300,000 loan for the import of Bucyrus-Eric excavators through **Mitsubishi International Corporation** of New York. Deposits of phosphate at Olinda, Pernambuco, are the largest in South America, containing over 50,000,000 tons.

**BOLIVIA**—The government has offered a \$6,000,000 settlement to the **Patino** group of tin mining companies for property expropriated by the government about eight years ago. Payments would be made over an eight-year period. Last year the government offered a \$4,000,000 settlement. The present offer covers the entire Patino group which includes **Patino Mines and Enterprises Consolidated, Inc., Bolivia Tin & Tungsten Mining Corporation** and **Compania Minera Agricola Aploca de Bolivia**. The settlement offer is outside of retention payments made by the government since the seizure which have totalled some \$8,000,000, and were originally to be applied against any value set for the mines. Retention payments are based on varying percentages of the value of tin content in concentrates mined from the properties and sold to England.

**MEXICO**—**Beryllium Resources de Mexico, S. A.** has tripled production at the **Ensenada** gold mine since it obtained a lease for the placers in the mine area. Previously known as the **Princessa** group, the mine has gold placer deposits with values as high as \$5.00 per yard. It was abandoned by previous operators because of difficulties caused by flooding conditions. Modern mining techniques used by **Beryllium Resources** have increased net output to 180 yards per day. Cost of extraction is about 50 cents per yard. Although full extent of the Ensenada gold placer is not yet determined, it is estimated that present output can continue indefinitely. The Mexican firm, a subsidiary of **Beryllium Resources, Inc.**, of Los Angeles was organized for exploration, mining and concentration of beryllium minerals in Mexico. By arrangement with the Mexican government, profits realized from the Ensenada gold mine will remain in Mexico for that purpose.

**BOLIVIA**—**Corporacion Minera de Bolivia**, which is being reorganized, is undertaking several improvements to increase production at its tin mining and milling operations. The program includes a pre-concentration section at the **Catavai** mill scheduled for January completion at a cost of \$450,000; expansion of the **Colquiri** mill to increase capacity of ore treatment, completed in October; completion of the **Itos** mill at the **San Jose** mine of Oruro this season, and continued work on the hydroelectric plant of the **Quechisla** group of mines located at Punutuma. This plant with a capacity of 600 kilowatts is scheduled to be ready by the end of next year. The company continues to have labor difficulties which complicate its financial problems and most offers of financial aid call for reducing the number of unproductive workers.

**MEXICO**—Preliminary exploration work in the region around San Juan Nepomuceno, Chihuahua, has yielded high gold values. **Guillermo Quevedo**, owner of the property, plans increased activity in the area.

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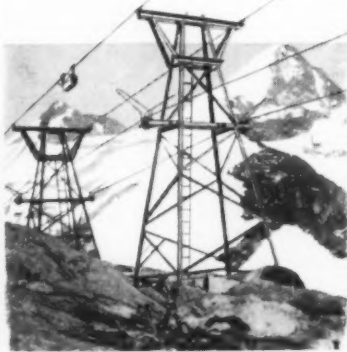
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## Diamond Milling

continued from page 35

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Technical education desirable. A background and following in the mining industry is required. Remuneration on commission basis. Give experience, education, personal data and territory covered in first letter. Company representative will interview in California and Arizona in February. Write Box 101, Mining World, 500 Howard St., San Francisco 5, Calif.

**FOR SALE — GOLD NUGGET**, \$3.00 Extra fine California gold dollar, rare collector's item, \$3.00. Loyd Casteele, 842 MW Birch, Sunnyvale, Calif.

**FOR SALE**—24-Jeffery Traylor Electric Vibrating Feeders Model 4 DTS 24 x 48 with controls—Bargain. 24 x 36 Farrell Bacon Jaw Crusher. Also Vibrating Screens and apron feeders. Wanted to buy: Cone Crushers. U.S. Minerals, P.O. Box 503, Crescent City, Calif. Phone IN 4-2932.

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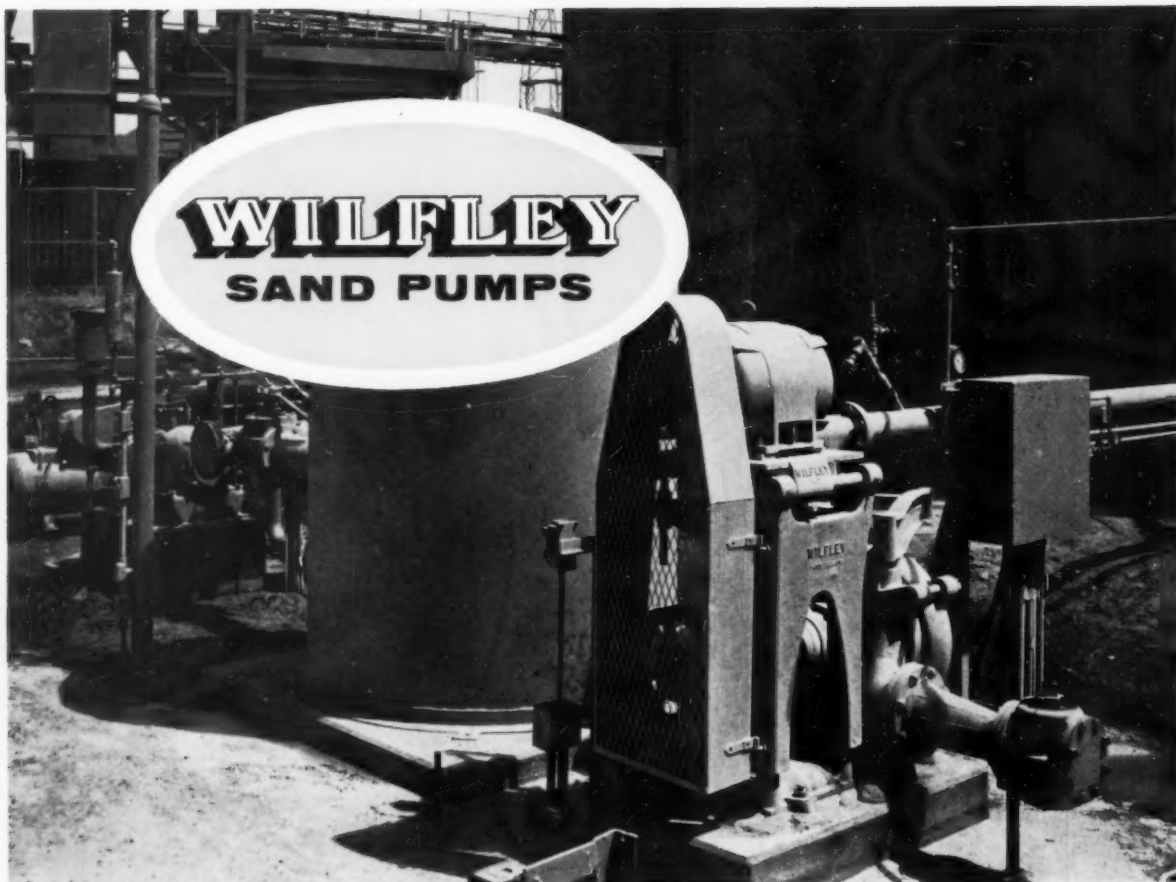
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